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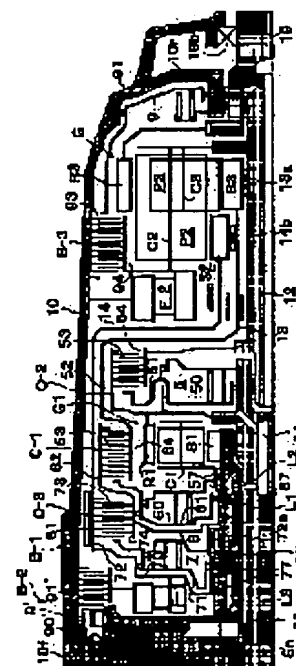
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## (54) AUTOMATIC TRANSMISSION FOR VEHICLE

(57)Abstract:

PROBLEM TO BE SOLVED: To suppress the increase of the number of leak stop spots of the feed oil passage of a hydraulic servo pump occasioned by bringing a vehicle automatic transmission into a multistage and to prevent reduction of transmission efficiency due to slide resistance of a seal ring.

SOLUTION: A vehicle automatic transmission to achieve multistage automatic speed change by selectively inputting a plurality of input rotation to a planetary gear set G is coupled to an input shaft 11 through an acceleration planetary gear G1 and comprises first and third clutches C-1 and C-3 to input acceleration rotation to a planetary gear set; and a second clutch C-2 coupled directly to an input shaft and inputting acceleration rotation to a planetary gear set. A deceleration planetary gear is arranged with one element S1 fixed at the tip of the boss part 10f of a transmission case wall 10, and the hydraulic servomotors 6 and 7 of first and third clutches are arranged on a boss part. The hydraulic servomotor 5 of the second clutch is arranged at a deceleration planetary gear on the opposite side to the hydraulic servomotors 6 and 7 and feed oil passages L1 and L3 to the hydraulic servomotors are arranged at a boss part.



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**CLAIMS**

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**[Claim(s)]**

**[Claim 1]** It is the automatic transmission for cars which inputs two or more input rotations into a planetary-gear set alternatively, and attains multistage automatic gear change. The 1st and 3rd clutches which are connected with an input shaft through moderation planetary gear, and input moderation rotation into a planetary-gear set, In what has the 2nd clutch which is directly connected with an input shaft and inputs non-slowng down rotation into a planetary-gear set moderation planetary gear From the case wall of a change gear, the one element is fixed at the tip of the boss section by which total material was carried out, and it is arranged. The hydraulic servo of the 1st clutch and the 3rd clutch It is arranged on the boss section. The hydraulic servo of the 2nd clutch The automatic transmission for cars characterized by having been arranged with the hydraulic servo of the 1st and 3rd clutches in the opposite side, and preparing the supply oilway of the oil pressure to the hydraulic servo of the 1st clutch and the 3rd clutch in the boss section to moderation planetary gear.

**[Claim 2]** said planetary-gear set -- the 1-, while having the 4th gear change element, connecting the 1st gear change element with the output side member of the 1st clutch and connecting the 2nd gear change element with the output side member of the 3rd clutch The automatic transmission for cars according to claim 1 with which the stop in a change gear case was enabled by the 2nd stop means, and the 4th gear change element was connected with the output member while the stop in a change gear case was enabled by the 1st stop means and the 3rd gear change element was connected with the output side member of the 2nd clutch.

**[Claim 3]** The hydraulic servo of said 1st clutch is arranged from the hydraulic servo of the 3rd clutch at a moderation planetary-gear side. The clutch drum of the 1st clutch It connects with the output element of moderation planetary gear. The hub of the 3rd clutch It is the automatic transmission for cars according to claim 1 or 2 with which it connected with the output element of moderation planetary gear through the clutch drum of the 1st clutch, and the clutch drum of the 3rd clutch was connected with 1 gear change element of a planetary-gear set.

**[Claim 4]** It is the automatic transmission for cars according to claim 1 or 2 with which the hydraulic servo of said 1st clutch has been arranged from the hydraulic servo of the 3rd clutch at the moderation planetary-gear side, the clutch drum of the 1st clutch was connected with the output element of moderation planetary gear, and the clutch drum of the 3rd clutch was connected with the output element of moderation planetary gear through the clutch drum of the 1st clutch.

**[Claim 5]** The hydraulic servo of said 1st and 3rd clutches is the automatic transmission for cars according to claim 4 which made common the cylinder which constitutes them, while was fitted in inside this cylinder, has a piston and the piston of another side by which the tegmentum was carried out outside, and was made into the hydraulic servo of the confrontation which makes the actuation direction of both [ these ] pistons the reverse sense mutually.

**[Claim 6]** It is the automatic transmission according to claim 4 with which the hydraulic servo of said 1st and 3rd clutches has been arranged at the sense in which those cylinders carry out opening to a moderation planetary-gear side, the clutch drum of the 3rd clutch was connected with the clutch drum of the 1st clutch by the bore side, and the hub of the 3rd clutch was connected with 1 gear change element of a planetary-gear set through the periphery of the 1st clutch.

**[Claim 7]** It is the automatic transmission for cars according to claim 1 or 2 with which the supply oilway to the hydraulic servo of the 2nd clutch was opened for free passage by the oilway prepared in the case wall of another side by connecting the clutch drum of said 2nd clutch with an input shaft at relative rotation impossible.

**[Claim 8]** It is the automatic transmission for cars according to claim 7 with which the supply oilway to the

hydraulic servo of the 2nd clutch was opened for free passage through the oilway of an input shaft and an output shaft by the oilway prepared in the case back end wall by arranging the output shaft of a change gear at the case back end section on said input shaft and same axle.

[Claim 9] It is the automatic transmission for cars according to claim 8 with which this oilway for lubrication was opened for free passage by preparing the oilway for lubrication in said input shaft by the oilway prepared in the boss section which has a supply oilway to the hydraulic servo of the 1st and 3rd clutches.

[Claim 10] It is the automatic transmission for cars according to claim 7 with which the supply oilway to the hydraulic servo of the 2nd clutch was opened for free passage by the oilway prepared in the boss section of another side by arranging the hydraulic servo of said 2nd clutch on the boss section of another side by which total material was carried out from the case wall of another side.

[Claim 11] Said oilway for lubrication is the automatic transmission for cars according to claim 10 opened for free passage by the supply oilway prepared in the case wall of another side.

[Claim 12] Said 2nd clutch is the automatic transmission for cars according to claim 1 or 2 opened for free passage through the oilway of an input shaft by the oilway by which relative rotation impossible was made to connect a clutch drum with an input shaft, it has been arranged, and the supply oilway to the hydraulic servo of the 2nd clutch was prepared at the boss section on the input shaft which adjoined moderation planetary gear.

[Claim 13] The clutch drum of said 2nd clutch is an input member to moderation planetary gear, and the communalized automatic transmission for cars according to claim 12.

[Claim 14] For the case wall to which the total material of the boss section which has a supply oilway to the hydraulic servo of the 1st and 3rd clutches was carried out, the oilway for lubrication prepared in said input shaft is the automatic transmission for cars according to claim 13 opened for free passage by the supply oilway prepared in the case wall of the opposite side.

[Claim 15] The supply oilway to the hydraulic servo of said 2nd clutch is the automatic transmission for cars according to claim 10 or 13 by which was opened for free passage in the back end section of an input shaft by the oilway prepared in the case wall, and the sealing device was carried out with one seal ring in between an input shaft and the case walls surrounding the periphery.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] Especially this invention relates to the supply technique of the servo oil pressure to each clutch in the gear train about the automatic transmission for cars.

[0002]

[Description of the Prior Art] The automatic transmission used for the drive which makes an engine etc. the source of power has the demand of multistage-izing, when aiming at energy saving by the power transfer with the sufficient effectiveness according to a load, and the change gear style of the automatic transmission for passenger cars is shifting to the thing of the thing of the conventional advance 4th speed to the 5th speed from such a demand, for example. Meanwhile, in order to realize further multistage-ization in the limited loading tooth space, much more formation of a small element of a gear train and the simplification of a device are needed. Then, the gear train which attains advance 6 \*\* and the go-astern 1st speed is proposed in JP,4-219553,A in three clutches and two brakes which operate it using the planetary-gear set which consists of the minimum gear change element. The gear train concerning this proposal makes it input as engine power rotation and an input from which two rates differ to the planetary-gear set which consists suitably of four gear change elements of a change gear style strictly turbine-output rotation of a torque converter and the rotation which slowed it down using three clutches, and multistage advance 6 \*\* is attained by stopping two gear change elements in a change gear case in two brakes.

[0003]

[Problem(s) to be Solved by the Invention] The gear train configuration concerning the above-mentioned proposal is very rational in the number of the number of gear change elements per gear ratio, the clutch to need, and brakes. By the way, in the part passing through between the members which carry out relative rotation, the oilway which generally supplies oil pressure to a clutch or a brake arranges a seal ring, in order to prevent leakage, but since such a seal ring is what produces the seal effectiveness with the pressure welding, it produces a comparatively big sliding friction by relative rotation. Therefore, if there are many seal rings arranged, the increase of the rotational resistance of a rotation member and power loss will become large. Moreover, a high precision is needed in order that the slot which arranges a seal ring may carry out the seal of the oil by contact of a slot and a seal ring. Moreover, since a seal ring and the part which slides may be worn out by relative rotation with a seal ring, processing of hardening etc. is needed for wear prevention. Therefore, if a large number [ a seal ring slot ], a processing man day and a conversion cost will increase and it will become a cost rise. Thus, as for a seal part, lessening as much as possible is desirable. When the gear train of the above-mentioned conventional technique is seen from the point of such an oilway configuration, in this train Since there are two input-side power transfer paths in which the output from a torque converter is slowed down through moderation planetary gear as it is on the other hand by one side, and it is inputted into a planetary-gear set, Since it becomes the free passage arrangement to which the supply oilway of the oil pressure supplied to them from a change gear case depending on arrangement of the hydraulic servo of each clutch which switches a power transfer path for gear change becomes complicated, and an oilway crosses repeatedly between the members which carry out relative rotation, many seal rings are needed.

[0004] Generally, although the hydraulic pressure supply to the hydraulic servo of each clutch is made from the front end wall and back end wall of a change gear case, in order to simplify a supply oilway configuration, it can prepare a center support in the pars intermedia of a change gear case, and can lessen the number of seal rings because it is made to perform hydraulic pressure supply also from this support. However, as for the attachment of a such center support, it is desirable only the part which makes this

support enter between change gear styles not only will to lengthen axial length of a change gear, but to simplify a supply oilway configuration without such an approach, if it can do since it becomes an invitation of the increment in components mark and cost quantity. It is difficult to decrease a seal ring sharply in the gear train of the above-mentioned conventional technique, especially, even if it attaches a center support, in order to form a multiplex shaft, if it does not take into consideration having two inputs from which a rotational frequency differs.

[0005] This invention is made in view of such a situation, makes the minimum the number of the seal rings which become the configuration of a change gear case, and the factor of power loss [ in / it is the device of the array of a clutch hydraulic servo, and / the above-mentioned gear train ], without using a center support, and aims at offering the automatic transmission for cars which raised effectiveness.

[0006]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, this invention is an automatic transmission for cars which inputs two or more input rotations into a planetary-gear set alternatively, and attains multistage automatic gear change. The 1st and 3rd clutches which are connected with an input shaft through moderation planetary gear, and input moderation rotation into a planetary-gear set, In what has the 2nd clutch which is directly connected with an input shaft and inputs non-slowng down rotation into a planetary-gear set moderation planetary gear From the case wall of a change gear, the one element is fixed at the tip of the boss section by which total material was carried out, and it is arranged. The hydraulic servo of the 1st clutch and the 3rd clutch It is arranged on the boss section, and to moderation planetary gear, with the hydraulic servo of the 1st and 3rd clutches, it is arranged in the opposite side and, as for the hydraulic servo of the 2nd clutch, the supply oilway of the oil pressure to the hydraulic servo of the 1st clutch and the 3rd clutch is characterized by being prepared in the boss section.

[0007] and as a concrete configuration of a gear train said planetary-gear set -- the 1-, while having the 4th gear change element, connecting the 1st gear change element with the output side member of the 1st clutch and connecting the 2nd gear change element with the output side member of the 3rd clutch While a stop in a change gear case is enabled by the 1st stop means and the 3rd gear change element is connected with the output side member of the 2nd clutch, it is effective for a stop in a change gear case to be enabled by the 2nd stop means, and to consider as the configuration in which the 4th gear change element was connected with the output member.

[0008] As one configuration of the array of a clutch hydraulic servo, next, the hydraulic servo of said 1st clutch It is arranged from the hydraulic servo of the 3rd clutch at a moderation planetary-gear side. The clutch drum of the 1st clutch It connects with the output element of moderation planetary gear. The hub of the 3rd clutch It connects with the output element of moderation planetary gear through the clutch drum of the 1st clutch, and, as for the clutch drum of the 3rd clutch, it is effective to consider as the configuration connected with 1 gear change element of a planetary-gear set.

[0009] Moreover, as other configurations of the array of a clutch hydraulic servo, the hydraulic servo of said 1st clutch is arranged from the hydraulic servo of the 3rd clutch at a moderation planetary-gear side, the clutch drum of the 1st clutch is connected with the output element of moderation planetary gear, and, as for the clutch drum of the 3rd clutch, it is also effective to consider as the configuration connected with the output element of moderation planetary gear through the clutch drum of the 1st clutch.

[0010] It is effective to take the structure made into the hydraulic servo of the confrontation which the hydraulic servo of said 1st and 3rd clutches made common the cylinder which constitutes them, and while was fitted in inside this cylinder in the configuration besides the above, has a piston and the piston of another side by which the tegmentum was carried out outside, and makes the actuation direction of both [ these ] pistons the reverse sense mutually.

[0011] In a configuration besides the above moreover, the hydraulic servo of said 1st and 3rd clutches It is arranged at the sense in which those cylinders carry out opening to a moderation planetary-gear side. The clutch drum of the 3rd clutch It connects with the clutch drum of the 1st clutch by the bore side, and, as for the hub of the 3rd clutch, it is also effective to take the structure connected with 1 gear change element of a planetary-gear set through the periphery of the 1st clutch.

[0012] Moreover, as a configuration of further others of the array of a clutch hydraulic servo, the clutch drum of said 2nd clutch is connected with an input shaft at relative rotation impossible, and, as for the supply oilway to the hydraulic servo of the 2nd clutch, it is also effective to take the structure opened for free passage by the oilway prepared in the case wall of another side.

[0013] In the above-mentioned configuration, the output shaft of a change gear is arranged at the case back end section on said input shaft and same axle, and, as for the supply oilway to the hydraulic servo of the 2nd

clutch, it is effective to take the structure opened for free passage through the oilway of an input shaft and an output shaft by the oilway prepared in the case back end wall.

[0014] In the above-mentioned configuration, the oilway for lubrication is prepared in said input shaft, and, as for this oilway for lubrication, it is still more effective to take the structure opened for free passage by the oilway prepared in the boss section which has a supply oilway to the hydraulic servo of the 1st and 3rd clutches.

[0015] Moreover, in a configuration besides the above, the hydraulic servo of said 2nd clutch is arranged on the boss section of another side by which total material was carried out from the case wall of another side, and, as for the supply oilway to the hydraulic servo of the 2nd clutch, it is also effective to take the structure opened for free passage by the oilway prepared in the boss section of another side.

[0016] As for said oilway for lubrication, in the above-mentioned configuration, it is effective to take the structure opened for free passage by the supply oilway prepared in the case wall of another side.

[0017] Moreover, as a configuration of further others of the array of a clutch hydraulic servo, said 2nd clutch makes an input shaft connect a clutch drum at relative rotation impossible on the input shaft which adjoined moderation planetary gear, is arranged, and can also be taken with the configuration opened for free passage through the oilway of an input shaft by the oilway in which the supply oilway to the hydraulic servo of the 2nd clutch was prepared at the boss section.

[0018] In this case, as for the clutch drum of said 2nd clutch, it is effective to take the input member to moderation planetary gear and the communalized structure.

[0019] As for the case wall to which the total material of the boss section which has a supply oilway to the hydraulic servo of the 1st and 3rd clutches was carried out, in the above-mentioned configuration, it is [ the oilway for lubrication prepared in said input shaft ] effective to take the structure opened for free passage by the supply oilway prepared in the case wall of the opposite side.

[0020] Moreover, the oilway prepared in the case wall depending on the array of a clutch hydraulic servo is open for free passage in the back end section of an input shaft, and the supply oilway to the hydraulic servo of said 2nd clutch can also take the structure by which the sealing device was carried out with one seal ring in between an input shaft and the case walls surrounding the periphery.

[0021]

[Function and Effect of the Invention] With the configuration of the claim 1 above-mentioned publication, since an oil can be supplied to the hydraulic servo of the 1st and 3rd clutches by the sealing device by the seal ring of a pair, respectively from the oilway prepared in boss circles since the hydraulic servo of the 1st and 3rd clutches was arranged on the boss section by which total material was carried out from the case, a sliding friction can be reduced sharply. Moreover, since the 1st and 3rd clutches have arranged the hydraulic servo of the 2nd clutch to the opposite side to moderation planetary gear, it is lost that the member which transmits moderation rotation in the middle of the supply path to the hydraulic servo of the 2nd clutch intervenes, and the increment in the seal ring by input rotation being two lines can be prevented. And since a seal ring can be pressed down few by these, indispensable processing is also reduced by the sealing surface and a processing man day and a conversion cost can be held down at a low price. Moreover, since it can communalize with the boss section which prepares the oilway for not establishing the special support wall for fixing that one element, and supplying an oil for this fixed part to the hydraulic servo of the 1st and 3rd clutches further since that one element was always fixed about moderation planetary gear in the boss section by which total material was carried out from the case, a change gear can be constituted in a compact.

[0022] And with a configuration according to claim 2, the automatic transmission for cars of 6 \*\* which can attain the above-mentioned effectiveness is realizable.

[0023] Next, with a configuration according to claim 3, since moderation rotation of moderation planetary gear is transmitted to the clutch drum of the 1st clutch of moderation planetary-gear approach and moderation rotation is transmitted to the hub which is the input flank material of the 3rd clutch through the clutch drum of the 1st clutch, the connection member for moderation rotation transfer is not needed for the inner circumference side of the 1st clutch. Therefore, since direct oil pressure can be supplied to the hydraulic servo of both clutches from the boss section, the number of seal rings can be lessened.

[0024] Moreover, with a configuration according to claim 4, since moderation rotation of moderation planetary gear is transmitted to the clutch drum of the 1st clutch of moderation planetary-gear approach and moderation rotation is transmitted to the clutch drum which is the input flank material of the 3rd clutch of a side far from moderation planetary gear through the clutch drum of the 1st clutch, the connection member for moderation rotation transfer is not needed for the inner circumference side of the 1st clutch. Therefore, since direct oil pressure can be supplied to a hydraulic servo from the boss section, the number of seal rings

can be lessened.

[0025] Furthermore, with a configuration according to claim 5, since the member which constitutes the hydraulic servo of the 1st and 3rd clutches is communalized, by miniaturization of the hydraulic servo of both clutches, it can combine with reduction of seal rings and the compact of a change gear can be planned.

[0026] Furthermore, with a configuration according to claim 6, since the input rotation slowed down by moderation planetary gear can always be inputted into the clutch drum side of the 3rd clutch, taking the structure which does not arrange other members on the periphery of the 3rd clutch, input rotation is detectable with the periphery side of the clutch drum of the 3rd clutch. Therefore, the need of embedding a rotation sensor to the interior of a change gear can be abolished like the connection structure which must carry out direct detection of the input rotation from an input shaft, and miniaturization of a change gear can be attained.

[0027] Furthermore, with a configuration according to claim 7, since the supply oilway to the hydraulic servo of the 2nd clutch was prepared in the case wall different from the supply oilway to the hydraulic servo of the 1st and 3rd clutches, the complication is avoidable with distribution of an oilway. And although the oilway and the above-mentioned supply oilway of \*\* of a free passage will become complicated further when the supply oilway to the hydraulic servo of the 1st and 3rd clutches is especially made into the case wall side which consists of oil pump bodies, each such oilway can be distributed with sufficient balance by preparing the supply oilway to the hydraulic servo of the 2nd clutch in another case wall as mentioned above. [ valve body / an oil pump and ]

[0028] Furthermore, with a configuration according to claim 8, since supply of the oil pressure to the hydraulic servo of the 2nd clutch is made from a case back end wall, concentration of the oilway by the side of the case front end wall usually constituted with an oil pump body is avoidable.

[0029] Furthermore, with a configuration according to claim 9, by preparing a lubricating oil supply oilway in the boss section, since a lubricating oil can be supplied from the boss section which carried out the direct side to the input shaft, the seal ring for the sealing device of a lubricating oil way can also be lessened, and a seal ring required as a whole can be pressed down few.

[0030] Furthermore, with a configuration according to claim 10, since hydraulic pressure supply to the hydraulic servo of the 2nd clutch can be performed without minding an input shaft, the sealing device of the supply oilway to the hydraulic servo of the 2nd clutch can be carried out with 1 set of minimum seal rings. Moreover, since it becomes the configuration which shares the boss section to support of an input shaft, and supply of oil pressure, the axial length of a change gear can be shortened by communalization of a member.

[0031] Furthermore, a seal ring can be lessened with a configuration according to claim 11, distributing the oilway of a case wall, since the supply oilway to the hydraulic servo of the 1st and 3rd clutches, the supply oilway to the hydraulic servo of the 2nd clutch, and the supply oilway of a lubricating oil can be prepared in case wall with two [ another at a time ].

[0032] Furthermore, with a configuration according to claim 12, the sealing device also of the oilway to the hydraulic servo of the 2nd clutch can be carried out with 1 set of seal rings.

[0033] Furthermore, since the input member and clutch drum to moderation planetary gear can be communalized, a change gear can consist of configurations according to claim 13 in a compact.

[0034] Furthermore, with a configuration according to claim 14, since oil pressure was supplied to the lubricating oil way from the case wall of the opposite side with the boss section to the boss section in which the supply oilway to the hydraulic servo of three clutches was prepared, concentration of the oilway of the boss section is avoidable.

[0035] Furthermore, with a configuration according to claim 15, the number of seal rings of the whole sealing-device [ of the supply oilway to the hydraulic servo of each clutch ] and sealing-device sake of a lubricating oil way can be made into the minimum.

[0036]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained along with a drawing. Drawing 1 - drawing 4 show the 1st operation gestalt which applied this invention to the automatic transmission for cars of a front engine rear drive (FR) format. This automatic transmission inputs two or more input rotations into the planetary-gear set G alternatively, and is having multistage automatic gear change attained as a skeleton shows a whole configuration to drawing 1 .

[0037] In this automatic transmission, the torque converter 4 with a lock-up clutch connected with the engine which is not illustrated at the foremost part of that device is arranged, it holds in the change gear case 10 at that posterior part, and the configuration by which the change gear style which attains advance 6 \*\* and the go-astern 1st speed has been arranged is taken. The planetary-gear set G whose change gear style



has an input shaft 11 and four gear change elements S2, S3, C2 (C3), and R3. It considers as the configuration equipped with the moderation planetary gear G1, three clutches (C-1, C-2, C-3) which input moderation and non-slowng down rotation into the planetary-gear set G, and two stop means (B-1, F-1, B-2 and B-3, F-2) per set to stop a gear change element.

[0038] Next, the gear train of this operation gestalt is further explained to a detail. A torque converter 4 is equipped with the pump impeller 41, the turbine runner 42, the stator 43 arranged among them, the one-way clutch 44 which makes the change gear case 10 carry out one direction rotation engagement of the stator 43, and the stator shaft 45 which fixes the inner ball race of an one-way clutch to the change gear case 10.

[0039] The planetary-gear set G which forms the subject of a change gear style gets into gear to a ring wheel R3 (R2) while gearing with the sun gears S2 and S3 of a pair with which the diameters of size differ mutually and one side's gearing to the sun gear S2 of a major diameter, and it consists of RABINYO-type gear sets by which another side consists of a carrier C2 (C3) which supports the pinions P2 and P3 of a pair which gear to the sun gear S3 of a minor diameter. and -- this gestalt -- the 1- the minor diameter sun gear S3 as 3rd gear change element, the major-diameter sun gear S2, and a carrier C2 (C3) are connected with each clutch (C-1, C-2, C-3) as an input element, and the ring wheel R3 (R2) as 4th gear change element is connected with the output shaft 19 as an output element. The minor diameter sun gear S3 is connected with an input shaft 11 through the moderation planetary gear G1 in detail with the 1st clutch (C-1). While the major-diameter sun gear S2 is connected with an input shaft 11 through the moderation planetary gear G1 with the 3rd clutch (C-3), a stop in the change gear case 10 is enabled by the 1st stop means (B-1, F-1, B-2). While a carrier C3 is connected with an input shaft 11 with the 2nd clutch (C-2), a stop in the change gear case 10 is enabled by the 2nd stop means (B-3, F-2), and the ring wheel R3 is connected with the output shaft 19.

[0040] The moderation planetary gear G1 consist of simple planetary gear, and the ring wheel R1 as the input element is connected with an input shaft 11. While the carrier C1 as an output element is connected through the 1st clutch (C-1), the 1st gear change element S3, i.e., minor diameter sun gear. It connects through the 3rd clutch (C-3), the 2nd gear change element S2, i.e., major-diameter sun gear, and the sun gear S1 as a fixed element which takes reaction force is fixed to the change gear case 10.

[0041] The automatic transmission which consists of such a configuration changes gears based on a car load in the range of the gear ratio according to the range chosen by the operator by control by the electronic control and hydraulic control which are not illustrated. Drawing 2 diagrammatizes and shows the gear ratio attained by engagement and release (engagement and the engagement which does not carry out to the engagement only at the time of engine brake by release and \*\* mark, and does not carry out a direct action to achievement of a gear ratio by - mark by the-less mark are expressed with O mark) of each clutch and a brake. Moreover, drawing 3 shows the relation between the gear ratio attained by engagement (those engagement is expressed with - mark) of each clutch and a brake, and the rotational frequency ratio of each gear change element at that time with a velocity diagram.

[0042] So that both drawings may be combined and referred to and may be known the 1st \*\* (1ST) Engagement of a clutch (C-1) and a brake (B-3) (in this gestalt, although engagement of this brake (B-3) is considered as the time of engine brake and automatic engagement of an one-way clutch (F-2) is instead used so that it may understand with reference to an actuation graph) why the reason for using this engagement and this engagement are equivalent to engagement of a brake (B-3) is explained in full detail behind. It is attained. In this case, reaction force is taken on the carrier C3 with which the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 was inputted into the minor diameter sun gear S3 via the clutch (C-1), and was stopped by engagement of an one-way clutch (F-2), and moderation rotation of the maximum reduction gear ratio of a ring wheel R3 (R2) is outputted to an output shaft 19.

[0043] Next, the 2nd \*\* (2ND) is attained by engagement (why these engagement is equivalent to engagement of a brake (B-1) is explained in full detail behind.) of the brake (B-2) which confirms engagement and it of a clutch (C-1) and the one-way clutch (F-1) equivalent to engagement of a brake (B-1). In this case, reaction force is taken to the major-diameter sun gear S2 with which the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 was inputted into the minor diameter sun gear S3 via the clutch (C-1), and was stopped by engagement of a brake (B-2) and an one-way clutch (F-1), and moderation rotation of a ring wheel R3 (R2) is outputted to an output shaft 19. The reduction gear ratio at this time becomes smaller than the 1st \*\* (1ST) so that it may see to drawing 3.

[0044] Moreover, the 3rd \*\* (3RD) is attained by coincidence engagement of a clutch (C-1) and a clutch (C-3). In this case, the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 is inputted into the major-diameter sun gear S2 and the minor diameter sun gear S3 via a clutch (C-1) and a



clutch (C-3) at coincidence. Since the planetary-gear set G will be in a direct connection condition, rotation of the same ring wheel R3 (R2) as the input rotation to both sun gears is outputted to an output shaft 19 as rotation slowed down to rotation of an input shaft 11.

[0045] Furthermore, the 4th \*\* (4TH) is attained by coincidence engagement of a clutch (C-1) and a clutch (C-2). In this case, the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 by one side is inputted into a sun gear S3 via a clutch (C-1). The non-slowng down rotation inputted via the clutch (C-2) from the input shaft 11 on the other hand is inputted into a carrier C3 through an intermediate shaft 12, and middle rotation of two input rotations is outputted to an output shaft 19 as rotation of the ring wheel R3 (R2) slightly slowed down to rotation of an input shaft 11.

[0046] Next, the 5th \*\* (5TH) is attained by coincidence engagement of a clutch (C-2) and a clutch (C-3). In this case, the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 by one side is inputted into a sun gear S2 via a clutch (C-3). The rotation which the non-slowng down rotation inputted via the clutch (C-2) from the input shaft 11 was inputted into the carrier C2, and accelerated it by the intermediate-shaft 12 course on the other hand more slightly than rotation of the input shaft 11 of a ring wheel R3 (R2) is outputted to an output shaft 19.

[0047] And the 6th \*\* (6TH) is attained by engagement of a clutch (C-2) and a brake (B-1). In this case, non-slowng down rotation is inputted only into a carrier C2 via a clutch (C-2) from an input shaft 11, reaction force is taken to the sun gear S2 stopped by engagement of a brake (B-1), and the rotation which accelerated the ring wheel R3 (R2) further is outputted to an output shaft 19.

[0048] In addition, go-astern (REV) is attained by engagement of a clutch (C-3) and a brake (B-3). In this case, reaction force is taken on the carrier C2 with which the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 was inputted into the sun gear S2 via the clutch (C-3), and was stopped by engagement of a brake (B-3), and the inversion of a ring wheel R3 (R2) is outputted to an output shaft 19.

[0049] Here, the relation of the one-way clutch (F-2) and brake (B-3) which touched previously, and the relation between an one-way clutch (F-1) and both brakes (B-1, B-2) are explained. both [ these ] brakes serve as the so-called friction element to which one release, simultaneously engagement of another side are carried out at the time of an up-and-down shift by both gear change interstage and which holds again and is carried out so that it may see in engagement / release relation of both the brakes at the time of the 1st above \*\* and the 2nd \*\* (B-1, B-3). A hold substitute of such a friction element will cause addition of the control valve for it, complication of a hydraulic circuit, etc., in order to need the precise concurrency control of the engagement pressure of the hydraulic servo which operates them, and solution pressure discharge and to perform such control. By then, the thing to consider as a setup which doubled the engagement direction of an one-way clutch (F-2) in the reaction force torque support direction at the time of the 1st \*\* by the 1st \*\* and the 2nd \*\* with this gestalt using the reaction force torque concerning a carrier C2 (C3) being reversed. An one-way clutch (F-2) is made to demonstrate a function equivalent to engagement of a parenchyma top brake (B-3). It replaces with engagement of the brake at the time of the 1st \*\* (B-3) (however, since the direction of the reaction force torque which starts a carrier C2 (C3) in the state of the car coast of a wheel drive is reversed to the condition of an engine drive). in order to acquire the engine brake effectiveness, as \*\* mark shows, engagement of a brake B-3 is needed for drawing 2 -- the carrier C2 (C3) is stopped -- it divides and comes out. Therefore, when attaining a gear ratio, the configuration which attains the 1st \*\* by engagement of a brake B-3 can also be taken, without preparing an one-way clutch.

[0050] It can be realized about the case where the same relation as the above is a sun gear S2, and an one-way clutch (F-1) can be made to demonstrate a function equivalent to engagement of a parenchyma top brake (B-1) by considering as a setup which doubled the engagement direction of an one-way clutch (F-1) in the reaction force torque support direction at the time of the 2nd \*\* in this case. However, since unlike a carrier C2 (C3) this sun gear S2 is not only engaged in order to acquire the engine brake effectiveness at the time of the 2nd \*\*, but is a gear change element stopped also for the 6th \*\*\*\*\*, a brake (B-1) is needed. moreover, the sun gear S2 -- the velocity diagram of drawing 3 -- a solution or \*\* -- like, although it rotates to hard flow to an input hand of cut at the time of the 1st \*\*\*\*\*, in the case of the gear ratio of the 3rd more than \*\*, it rotates in the same direction as an input hand of cut. Therefore, since an one-way clutch (F-1) cannot be connected with a direct holddown member, it is considering effectiveness of an engagement condition as the controllable configuration by serial arrangement with a brake (B-2).

[0051] Thus, each gear ratio attained serves as a good rate step at equal intervals comparatively to each gear ratio so that it may understand qualitatively on the velocity diagram of drawing 3 with reference to spacing of the vertical direction of O mark which shows the velocity ratio of ring wheels R2 and R3. If a numeric

value is set up and this relation is expressed quantitatively concretely, it will become a step between the gear ratio shown in drawing 2. The gear ratio in this case is the case where it is set as gear ratio  $\lambda_3=0.375$  of the sun gear S1 of the moderation planetary gear G1, the sun gear S2 by the side of gear ratio  $\lambda_1=0.556$  of a ring wheel R1, and the major-diameter sun gear of the planetary-gear set G, the sun gear S3 by the side of gear ratio  $\lambda_2=0.458$  of a ring wheel R2 (R3), and a minor diameter sun gear, and a ring wheel R3, and gear ratio width of face is set to 6.049.

[0052] Next, with reference to drawing 4 which shows concrete arrangement of each element which constitutes the change gear style of an automatic transmission in the cross section [-izing / that reference should be made easy / the cross section / the \*\* type ], it explains still more concretely. In addition, vocabulary called a clutch shall name generically the hydraulic servo included in the clutch drum as the friction member considered as a wet multi-plate configuration, and its supporter [ an I/O member-cum-] material, and a hub and a drum by endocyst or the cylinder by which connection unification was carried out through this specification. Moreover, the hydraulic servo by which it was included in the hub as a friction member and its supporter [ an input member-cum-] material, the case part as a reaction force member, and the case also about the brake, and it was similarly included in endocyst or the cylinder by which connection unification was carried out about the thing of a wet multi-plate configuration shall be named generically. And about the brake of a band configuration, the hydraulic servo as a band conclusion means shall be named the band itself and the drum on which it is concluded generically.

[0053] The change gear case 10 where a change gear style is held has cylinder boss section 10a by which total material was carried out to it toward the way among change gears from 10f of front end walls while having 10f of front end walls which usually consist of an oil pump body and its covering in the front end. The moderation planetary gear G1 fix the sun gear S1 as the 1 gear-change element at the tip of cylinder boss section 10a, and are arranged at the periphery of cylinder boss section 10a. From the moderation planetary gear G1, on the periphery of front cylinder boss section 10a The hydraulic servos 6 and 7 of the 1st clutch (C-1) and the 3rd clutch (C-3) are arranged on the boss section that oil pressure should be supplied from the oilway prepared in boss section 10a. To the moderation planetary gear G1, in the hydraulic servos 6 and 7 of the 1st and 3rd clutches, the hydraulic servo 5 of the 2nd clutch (C-2) is arranged in the opposite side, and is supported by the periphery of the input shaft 11 behind the moderation planetary gear G1. Three oilways L1-L3 are formed in cylinder boss section 10a. Two oilways L1 and L3 in these oilways The hydraulic servos 6 and 7 of the 1st clutch (C-1) and the 3rd clutch (C-3) are open for free passage, respectively, and remaining one oilway L2 is opened for free passage by the hydraulic servo 5 of the 2nd clutch (C-2) through the inside of an input shaft 11.

[0054] Each oilways L1-L3 formed in cylinder boss section 10a The valve body which does not illustrate those upstream independently through 10f of front end walls which consist of an oil pump body, respectively is open for free passage. The downstream The 3rd oilway L3 is open for free passage through the direction oilway of a path of the foremost part of cylinder boss section 10a, and the hoop direction oilway which consists of slots of a boss section periphery in the cylinder 70 of the hydraulic servo 7 of the 3rd clutch (C-3). Moreover, the 1st oilway L1 is opened for free passage by the cylinder 60 of the hydraulic servo 6 of the 1st clutch (C-1) through the hoop direction oilway which turns into the direction oilway of a path of the pars intermedia of cylinder boss section 10a from the slot of a boss section periphery. Furthermore, opening of the 2nd oilway L2 is carried out to the inner circumference of cylinder boss section 10a by the direction oilway of a path of the posterior part of cylinder boss section 10a.

[0055] Next, the front end section was connected with the turbine runner 42 of the torque converter 4 shown in drawing 1, and the input shaft 11 is prolonged from 10f of front end walls of the change gear case 10 to the tip of cylinder boss section 10a. And an input shaft 11 is supported through a roller bearing by 10f of front end walls in a front end side, and the inner circumference at the tip of cylinder boss section 10a supports the back end side through the roller bearing. The input section to the moderation planetary gear G1 is used as a flange, and is connected with the ring wheel R1 as an input element of the moderation planetary gear G1. An axial hole is formed in the back end of an input shaft 11, and it considers as the supporter of an intermediate shaft 12. Oilway 11 within shaft a is formed in the input shaft 11, and opening is carried out to the axial periphery by the hoop direction oilway by which the anterior part is constituted from an input-shaft periphery slot through the direction oilway of a path. This periphery slot is adjusted in the shaft-orientations location in the direction oilway opening of a path of the 2nd oilway L2 by the side of said cylinder boss section 10a. Moreover, oilway 11 within shaft a of an input shaft 11 is open for free passage by the direction oilway of a path of the input-shaft 11 back end in the cylinder 50 of the hydraulic servo 5 of the 2nd clutch (C-2).

[0056] An output shaft 19 is supported by back end wall 10r of the change gear case 10 free [ rotation ] through a roller bearing in the front end section, and extension housing of immobilization in the change gear case 10 supports the back end section free [ rotation ] through ball bearing 19b. The connection section to the ring wheel R3 as an output element of the planetary-gear set G of an output shaft 19 is used as a flange, and is connected with the ring wheel R3 through the drum-like member. The axial hole whose diameter is expanded to two steps is formed in the front end of an output shaft 19, and it considers as the seal section with an intermediate shaft 12, and the supporter of an intermediate shaft 12.

[0057] The planetary-gear set G is arranged between the back end of an input shaft 11, and the front end of an output shaft 19, and is supported by the intermediate shaft 12 as a whole. In detail, the carriers C2 and C3 which support the pinions P2 and P3 of the planetary-gear set G are unified, the front end section is supported by the shank of the major-diameter sun gear S2 free [ rotation ] through a bearing bush, and the back end section is being fixed to the flange of an intermediate shaft 12. And the minor diameter sun gear S3 is supported by the intermediate shaft 12 free [ rotation ] through bearing bush 13a, and the major-diameter sun gear S2 is supported by the minor diameter sun gear S3 free [ rotation ] through bearing bush 14b. The direct and major-diameter sun gear S2 is supported for the minor diameter sun gear S3 by the intermediate shaft 12 through the minor diameter sun gear S3 in this way, the front end of carriers C2 and C3 is supported by the intermediate shaft 12 through the major-diameter sun gear S2 and the minor diameter sun gear S3, the back end of carriers C2 and C3 is directly fixed to an intermediate shaft 12, and the centering of each is carried out to the intermediate shaft 12. On the other hand, a ring wheel R3 is connected with the member prolonged from the flange of an output shaft 19 by spline fitting, and is supported by self-aligning \*\*\*\*.

[0058] The moderation planetary gear G1 are arranged at the tip periphery of cylinder boss section 10a, and the sun gear S1 is attached in the back end of the stator shaft 45 (refer to drawing 1 ) by which fit-in immobilization was carried out at the inner circumference of cylinder boss section 10a of the change gear case 10 by spline fitting in detail. Support-at-one-end support of the carrier C1 of the moderation planetary gear G1 is carried out by spline fitting at the inner circumference side boss section of the clutch drum 62 of the 1st clutch (C-1). And the ring wheel R1 is connected with the clutch drum 52 prolonged from the cylinder 50 of the 2nd clutch (C-2) fixed to the flange of an input shaft 11.

[0059] The back end section of the hub 54 is connected with the flange by the side of the front end of an intermediate shaft 12, a drum 52 is fixed to the flange of an input shaft 11, and the 2nd clutch (C-2) is supported by the back end of an input shaft 11. Spline engagement support of the separator plate is carried out at the inner circumference of a drum 52, spline engagement support is carried out at the periphery of the hub 54 where the inner circumference of friction material was connected with the flange of an intermediate shaft 12, and the friction member 53 which consists of the friction material and separator plate of many plates of a clutch (C-2) is arranged between the drum 52 and the hub 54. The piston 51 which the hydraulic servo 5 of a clutch (C-2) consists of gestalten by which endocyst was carried out to the drum 52, used the inside of a drum 52, and the periphery of an input shaft 11 as the cylinder 50, and was fitted in it free [ shaft-orientations sliding ], It considers as the configuration equipped with the return spring arranged between the cancellation plate by which the shaft-orientations stop was carried out to the input shaft 11, and a piston 51 and a cancellation plate, and contiguity arrangement is carried out behind the moderation planetary gear G1.

[0060] The 1st clutch (C-1) is supported by the periphery of cylinder boss section 10a free [ rotation ] in the boss section by the side of the inner circumference of the drum 62, and is connected with the carrier C1 of the moderation planetary gear G1 through the boss section. Spline engagement support of the friction member 63 which consists of the friction material and separator plate of many plates of a clutch (C-1) is carried out in a separator plate at the inner circumference of a drum 62, spline engagement support of the inner circumference of friction material is carried out at the periphery of a hub 64, it is arranged between a drum 62 and a hub 64, and the hub 64 is connected with the sun gear S3 through the drum-like connection member 13. The hydraulic servo 6 of a clutch (C-1) uses the inside of a drum 62 as a cylinder 60, and is considered as the configuration equipped with the return spring arranged between the piston 61 fitted in it free [ shaft-orientations sliding ], the cancellation plate by which the shaft-orientations stop was carried out to the boss section by the side of the inner circumference of a drum 62, and a piston 61 and a cancellation plate. The friction member 63 is located in the periphery side of the moderation planetary gear G1 in this arrangement.

[0061] The boss section by the side of the inner circumference of the drum 72 is supported by cylinder boss section 10a of the change gear case 10 through bearing 72a free [ rotation ], and, as for the 3rd clutch (C-3), the periphery section is connected with the sun gear S2 through the drum-like connection member 14. Spline

engagement support of the separator plate is carried out at the inner circumference of a drum 72, spline engagement support is carried out at the periphery of the hub 74 constituted on the drum 62 of the 1st clutch in the inner circumference of friction material, and the friction member 73 which consists of the friction material and separator plate of many plates of a clutch (C-3) is arranged between the drum 72 and the hub 74. The hydraulic servo 7 of a clutch (C-3) uses the inside of a drum 72 as a cylinder 70, and is considered as the configuration equipped with the return spring arranged between the piston 71 fitted in it free [ shaft-orientations sliding ], the cancellation plate by which the shaft-orientations stop was carried out to the boss section of a drum 72, and a piston 71 and a cancellation plate.

[0062] Let the brake (B-1) which constitutes one side of the 1st stop means be a band brake equipped with the band 81 which engages with the periphery by using the clutch drum 72 of the 3rd clutch (C-3) as a brake drum. The conclusion location of this band 81 is made into the periphery side in the same shaft-orientations location as bearing 72a which supports the boss section of a drum 72 to cylinder boss section 10a, and the moment produced when the conclusion location and the support location have shifted to shaft orientations at the time of brake conclusion loses, it is considered as the configuration which reduces the load concerning this bearing 72a, and, thereby, the miniaturization of bearing 72a is made. Moreover, since it connects with the sun gear S2 through the drum-like connection member 14, when the load at the time of the above-mentioned conclusion acts as moment force, the load of this load will be carried out to bearing bush 14b which supports a sun gear S2, but since such an excessive load is prevented by arrangement of the above-mentioned bearing 72a, this drum 72 is useful also to the miniaturization of bearing bush 14b. In addition, illustration is omitted about the hydraulic servo of this brake.

[0063] The brake (B-3) which constitutes one side of the 2nd stop means is used as the multiple disc brake which uses the friction material and separator plate of many plates as the friction member 93, spline stop support of the separator plate is carried out at change gear case 10 inner circumference, and spline engagement support of it is carried out in the hub 94 where friction material was fixed to the carrier C2. And the polymerization of the friction member 93 of this brake (B-3) is made to carry out in the direction of a path to the periphery side of the planetary gear of the minor diameter of the planetary-gear set G, and it is arranged. The hydraulic servo 9 of a brake (B-3) uses as a cylinder the annular crevice formed in back end wall 10r of the change gear case 10, and is considered as the configuration equipped with the piston 91 fitted in it free [ sliding ], and the return spring which a shaft-orientations stop is carried out to back end wall 10r, and contacts a piston 91. The extension which is extended along with the peripheral wall of the change gear case 10 of a piston 91, and results in the back end of the friction member 93 carries out fitting of the periphery to the spline of a case peripheral wall, and the baffle is carried out.

[0064] Moreover, the inner ball race is united with a drum 72, the one-way clutch (F-1) which constitutes another side of the 1st stop means is considered as the configuration united with the hub of a brake (B-2), and the outer race is arranged in the front of the 3rd clutch (C-3), i.e., the foremost part of a change gear style. Let the brake (B-2) which stops an outer race in the change gear case 10 be the brake of the multi-plate configuration which uses as a friction member the separator plate by which engagement support was carried out at the outer race at the friction material by which spline engagement support was carried out, and the inner circumference spline of the change gear case 10. Hydraulic-servo 9' of a brake (B-2) makes 10f of front end walls of the change gear case 10 cylinder 90', and is considered as the configuration equipped with piston 91' fitted in it free [ sliding ], and the return spring which a shaft-orientations stop is carried out to 10f of front end walls of the change gear case 10, and contacts piston 91'. Since 10f of front end walls of the change gear case 10 is made the arrangement tooth space of hydraulic-servo 9' of a brake (B-2) by such arrangement, the special member for hydraulic-servo formation becomes unnecessary, components mark are reduced by it, and, moreover, the axial length of a change gear is shortened by it.

[0065] And combine the inner ball race with the front end section of a carrier C2, and the one-way clutch (F-2) which constitutes another side of the 2nd stop means makes an outer race engage with the spline of the inner circumference of the change gear case 10, and is arranged ahead of the planetary-gear set G.

[0066] Above the drum 62 which connotes the hydraulic servo 6 of the 1st clutch (C-1) from a related configuration The friction member 63 is arranged in the periphery side of the moderation planetary gear G1, and it is made to connect with the carrier C1 of the moderation planetary gear G1. The drum 52 which is supported by the periphery of cylinder boss section 10a free [ rotation ], and connotes the hydraulic servo 5 of the 2nd clutch (C-2) The friction member 53 is arranged in the periphery side of a hydraulic servo 5, and it is made to connect with the ring wheel R1 of an input shaft 11 and the moderation planetary gear G1. The drum 72 which is fixed to the periphery of an input shaft 11 and connotes the hydraulic servo 7 of the 3rd clutch (C-3) It connects with the drum 62 of the 1st clutch (C-1) through the friction member 63 arranged in

the periphery side of the hydraulic servo 6 of the 1st clutch (C-1), and becomes the arrangement supported by the periphery of cylinder boss section 10a free [ rotation ]. In then, the relative rotation section between cylinder boss section 10a and the drum 62 of the 1st clutch (C-1), and between the drums 72 of the 3rd clutch (C-3) The seal rings 67 and 77 of every a pair which carries out the sealing device of the two oilways L1 and L3 which are open for free passage, respectively are arranged in the hydraulic servos 6 and 7 of the 1st clutch (C-1) and the 3rd clutch (C-3) from cylinder boss section 10a. The seal ring 57 of the pair which carries out the sealing device of the one oilway L2 which is open for free passage from cylinder boss section 10a to the hydraulic servo 5 of the 2nd clutch (C-2) to the relative rotation section between cylinder boss section 10a and an input shaft 11 is arranged.

[0067] thus, about the number of seal rings arranged in order to prevent the leakage of the oil between the oilways of the member which carries out relative rotation in the oilway which supplies oil pressure to the hydraulic servo of a clutch When there were many seal rings via which one oilway goes, cost not only starts, but a sliding friction increases by a pressure being applied to a seal ring and a power transmission efficiency is considered in the condition that oil pressure is applied to the oilway, there is a fault that a loss becomes large. Therefore, little way of a seal ring is good. With this operation gestalt, the seal ring of a lot is arranged about a seal ring at the oilway from each oilways L1-L3 formed in cylinder boss section 10a of the change gear case 10 to the hydraulic servo 6 of the 1st clutch (C-1). The seal ring of a lot is arranged at the oilway to the hydraulic servo 5 of the 2nd clutch (C-2), and the seal ring of a lot is arranged at the oilway to the hydraulic servo 7 of the 3rd clutch (C-3). Therefore, a total of 3 sets of necessary minimum seal rings will be arranged carrying out the sealing device of the three relative rotation sections. Thus, in this operation gestalt, since the number of seal rings can be lessened, the effectiveness that the loss in power transfer can consider as few automatic transmissions is acquired.

[0068] Without [ without it can make a seal ring without a center support into the minimum and lengthens axial length in this way according to the configuration of the above-mentioned operation gestalt, and ] making components mark increase, it is cheap, power loss is made to the minimum, and an efficient automatic transmission can be offered. Furthermore, since the input element of the moderation planetary gear G1 was connected with the input shaft 11 through the clutch drum 52 of the 2nd clutch, by the input member of the moderation planetary gear G1, and communalization of a clutch drum, axial length can be shortened and components mark can be decreased. Moreover, the piston projected net area of the hydraulic servo 5 of the 2nd clutch (C-2) can be greatly taken by arranging the hydraulic servo 5 of the 2nd clutch (C-2) on input-shaft 11 periphery, and it also becomes possible to use it for reduction or minor-diameter-izing of the relative miniaturization of the friction member 53, i.e., configuration number of sheets. Moreover, the advantage on which sliding resistance loss is low suppressed since it is smaller than the diameter of the seal ring of the others [ path / of a seal ring 57 ] in this gestalt although it is the clutch always engaged in the high-speed stage of the 4th more than \*\* as the 2nd clutch (C-2) is shown in drawing 2 as a description of this gear train and a seal ring 57 will slide among input-shaft 11 and cylinder boss section 10a in the state of hydraulic pressure supply at this time is also acquired.

[0069] In addition, in drawing 4 which shows the above-mentioned operation gestalt, a cable address Sn shows an input rotation sensor. This sensor Sn is required to detect the input rotation as information on an electronic control for change gear control, and in order to carry out approach arrangement of that detecting element at the irregularity of a large number formed in the periphery of an input shaft 11, laying-under-the-ground arrangement of it is carried out at 10f of front end walls.

[0070] by the way, with the above-mentioned 1st operation gestalt, mainly from the semantics [ the shaft-orientations dimension by concentration-izing of the 1st and 3rd clutches ] of compaction Although the power transfer to the input flank material of the 3rd clutch (C-3) took the arrangement accomplished from the drum 62 of the 1st clutch (C-1) to the hub 74 by the side of the inner circumference of the 3rd clutch (C-3) It is also effective that the above-mentioned power transfer takes the arrangement performed considering the drum 72 by the side of the periphery of the 3rd clutch (C-3) as input flank material in the semantics which gives priority to the ease which detects input rotation. Hereafter, in explanation of each operation gestalt, mutual arrangement of the 1st and 3rd clutches of said 1st operation gestalt is called the 1st clutch arrangement for short, and mutual arrangement of these clutches of the 2nd operation gestalt is called the 2nd clutch arrangement for short. Drawing 5 shows the gear train of the automatic transmission of the 2nd operation gestalt which takes such a configuration with the cross-section structure [-izing / structure / the \*\* type ]. Hereafter, the semantics which avoids duplication explains only difference with said 1st operation gestalt in this gestalt.

[0071] With this gestalt, connection relation with the moderation planetary gear G1 of the 3rd clutch (C-3) is

changed to the 1st operation gestalt. That is, the clutch drum 72 which connotes the hydraulic servo 7 of the 3rd clutch (C-3) is connected with the clutch drum 62 which connotes the hydraulic servo 6 of the 1st clutch (C-1), and juxtaposition at the carrier C1 which is the output element of the moderation planetary gear G1. And the friction member 73 of the 3rd clutch (C-3) is arranged at the periphery side of the hydraulic servo 7 of the 3rd clutch (C-3), and the hydraulic servo 6 of the 1st clutch (C-1), and the power transfer to the friction member 73 of the 3rd clutch (C-3) is considered as the arrangement made from a drum 72 side to a hub 74 side. Since the drum 72 of the 3rd clutch (C-3) with which the output rotation from the moderation planetary gear G1 is always transmitted serves as a layout located in the outermost periphery of a change gear style according to such arrangement, detection of the input rotation needed for control of an automatic transmission becomes possible easily, without laying a detection means under the inner of the change gear case 10. Therefore, the input rotation sensor Sn is attached in the periphery wall of the change gear case 10 with this gestalt.

[0072] Furthermore, although the configuration which used the drum 72 of the 3rd clutch (C-3) in the 1st operation gestalt as a drum of the band brake (B-1) as 1st stop means was taken with this gestalt Since such arrangement cannot be taken from relation with detection of the above-mentioned input rotation, arrange the one-way clutch (F-1) and brake (B-2) which have been arranged ahead of the 3rd clutch (C-3) between the moderation planetary gear G1 and an one-way clutch (F-2), and they are made to adjoin. The band brake which similarly uses the drum-like connection member 14 as a drum is allotted. The advantage of such arrangement is using the rigid inner ball race of a high one-way clutch (F-1) as the supporter which adjoined the drum comparatively, it is making the moment by the load at the time of brake conclusion received in an inner ball race, and an advantage is acquired that a moment load can be less than bearing bush 14b of a sun gear S2. In addition, hydraulic-servo 9' of a brake (B-2) is arranged as a thing of another object in the change gear case 10 with this layout modification at the periphery side of the outer race of an one-way clutch (F-2).

[0073] By the way, although it will have arranged to the before [ the planetary-gear set G ] side with both the above-mentioned operation gestalt if the 2nd clutch (C-2) which inputs non-slowng down rotation was made to adjoin the moderation planetary gear G1 and was put in another way, the 2nd clutch (C-2) can also be arranged to a side after the planetary-gear set G. Drawing 6 and drawing 7 show the 3rd operation gestalt which takes such arrangement with a skeleton and actual cross-section structure.

[0074] With this gestalt, since an input shaft 11 reaches to the back end section of a change gear style with a move behind the 2nd clutch (C-2) with reference to the skeleton of drawing 6 so that clearly, the intermediate shaft is abolished. The back end section of the input shaft 11 in this case is supported by the axial hole of an output shaft 19 by the same approach as support of the intermediate-shaft back end section in the 1st and 2nd operation gestalt, as shown in drawing 7. And the back end section of the drum 52 is fixed to the flange by the side of the back end of an input shaft 11, and the 2nd clutch (C-2) is supported by the cantilever condition. Engagement support of the separator plate is carried out at the inner circumference of a drum 52, engagement support of the inner circumference of friction material is carried out at the periphery of a hub 54, and the friction member 53 which consists of the friction material and separator plate of many plates of a clutch (C-2) is arranged between a drum 52 and a hub 54, and the front end of a hub 54 is fixed to the carrier C3 of the planetary-gear set G, and it is supported by the cantilever condition. The hydraulic servo 5 of a clutch (C-2) uses the inside of a drum 52, and the periphery of an input shaft 11 as a cylinder 50, and is considered as the configuration equipped with the return spring arranged between the piston 51 fitted in it free [ shaft-orientations sliding ], the cancellation plate by which the shaft-orientations stop was carried out to the input shaft 11, and a piston 51 and a cancellation plate.

[0075] With this 3rd operation gestalt, it lets one oilway pass in an input shaft 11, this oilway is divided forward and backward by closing in the location of the 2nd clutch (C-2), and oilway 11 for lubrication b and the oilway on the backside are set to supply oilway 11a to the 2nd clutch (C-2) for the oilway by the side of before. Therefore, the oilway within an output shaft 19 is opened for free passage in this case by the valve body which is not illustrated through the oilway L2 of back end wall 10r of the change gear case 10. Moreover, oilway 11b for lubrication is opened for free passage by the valve body through the oilway to which before side boss section 10a does not illustrate the front end section.

[0076] In the oilway for supplying a lubricating oil to the whole oilway or whole automatic transmission which supplies oil pressure to the hydraulic servo of a clutch with this 3rd operation gestalt in this way About the number of seal rings arranged in order to prevent the leakage of the oil between the oilways of the member which carries out relative rotation, and the number of the oilway formed by lapping in a shaft The seal ring arranged in the oilway from the back end section of the case 10 of a change gear to the hydraulic



servo 5 of the 2nd clutch (C-2) as it understands, even if it sees drawing 7 2 sets and one the oilway which supplies oil pressure to the 1st and 3rd hydraulic servos from the oilway formed in cylinder boss section 10a of the change gear case 10 -- respectively -- every 1 set -- and 1-set (not shown) arrangement is carried out into the oilway which supplies oil pressure to the lubricating oil way formed in the input shaft 11 from the oilway formed in body 10a of the case section 10 of a change gear. Therefore, a total of 5 sets and one seal ring will be arranged. Moreover, the number of the oilways within a shaft is one. Thus, with this operation gestalt, since the number of seal rings and the oilway within a shaft can be lessened, the effectiveness that there are few losses in power transfer and they can consider as an automatic transmission with a small shaft-orientations dimension is also acquired. Moreover, since the supply oilway L2 of the hydraulic servo 5 of the 2nd clutch was formed in the back end section of a case 10, concentration of the oilway of cylinder boss section 10a is avoidable.

[0077] Although each above operation gestalt materializes this invention with the gestalt of the vertical type automatic transmission for FR vehicles, this invention is also applicable to a front engine front drive (FF) or the horizontal type automatic transmission for rear engine Riyadh live (RR) vehicles. The operation gestalt of such a format is explained below.

[0078] Drawing 8 - drawing 12 show the horizontal type automatic transmission of the 4th operation gestalt which takes the gestalt of a transformer axle. Drawing 8 develops between shafts for the gear train in a common flat surface, and shows by the skeleton, and drawing 9 shows the actual axial physical relationship seen from the end face. This automatic transmission is considered as 3 shaft configurations in which each element was arranged on each shaft of the main shaft X which is mutually concurrent, the counter shaft Y, and the differential-gear shaft Z. And the planetary-gear set G which has four gear change elements S2, S3, C2 (C3), and R3 of the same configuration as the case of each of said operation gestalt around the input shaft 11 on a main shaft X The moderation planetary gear G1 and three clutches (C-1, C-2, C-3) are arranged, and it differs the case where it is said each operation gestalt, and a little, and has the configuration by which two brakes (B-1, B-2) and one one-way clutch (F-1) have been arranged.

[0079] Also in this automatic transmission, the minor diameter sun gear S3 as 1st gear change element of the planetary-gear set G is connected with an input shaft 11 through the moderation planetary gear G1 with the 1st clutch (C-1). While the major-diameter sun gear S2 as 2nd gear change element is connected with an input shaft 11 through the moderation planetary gear G1 with the 3rd clutch (C-3), a stop in a case 10 is enabled by the 1st brake (B-1). While the carrier C2 (C3) as 3rd gear change element is connected with an input shaft 11 with the 2nd clutch (C-2) A stop in a case 10 is enabled with the 2nd brake (B-3) in said each operation gestalt, the brake (B-2) equivalent to an one-way clutch (F-2), and an one-way clutch (F-1). The ring wheel R3 as 4th gear change element is connected with counter drive gear 19' as an output element. Although the one-way clutch (F-1) in said each gestalt and the engagement element which is equivalent to a serial brake (B-2) at it are abolished with this operation gestalt, this modification is because constraint of axial length is remarkably received compared with a vertical type.

[0080] Hereafter, difference with said each operation gestalt is mainly further explained to a detail for the gear train of this operation gestalt. On the main shaft X, the torque converter 4 with a lock-up clutch which transmits rotation of the engine which is not illustrated to an input shaft 11 is arranged. On the counter shaft Y, the output from a main shaft X side is reversed, and the idler gear 2 which gears to counter drive gear 19' that it should transmit to differential equipment 3 is arranged. On the differential-gear shaft Z, the differential-gear ring wheel 31 which gears on the idler gear 2 fixes to a differential case 32, and is prepared, differential rotation of the differential gear arranged in a differential case 32 is outputted to a lateral axis 30, and the configuration which considers as final wheel driving force is taken.

[0081] The configuration of the planetary-gear set G and the moderation planetary gear G1 and the connection relation between they and each engagement element are the same as that of the case of said operation gestalt as mentioned above. Therefore, the gear ratio attained by this change gear also becomes being the same as that of the case of each of said gestalt, and parenchyma. Drawing 10 diagrammatizes and shows the gear ratio attained by engagement and release (O mark expresses the engagement only at the time of engine brake by engagement and O mark with a parenthesis, and release is expressed with the-less mark) of each clutch and a brake. Moreover, drawing 11 shows the relation between the gear ratio attained by engagement (those engagement is expressed with - mark) of each clutch and a brake, and the rotational frequency ratio of each gear change element at that time with a velocity diagram. Since it can guess easily with reference to the above-mentioned engagement graph from the explanation in the previous 1st operation gestalt, power transfer for each gear ratio in this case omits explanation so that it may avoid redundancy.

[0082] It becomes a good rate step at equal intervals comparatively to each gear ratio so that it may



understand qualitatively on the velocity diagram of drawing 11 also about each gear ratio attained according to this operation gestalt with reference to spacing of the vertical direction of O mark which shows the velocity ratio of ring wheels R2 and R3. If a numeric value is set up and this relation is expressed quantitatively concretely, it will become the gear ratio and the step which are shown in drawing 10. The gear ratio in this case Gear ratio  $\lambda_1 = 44/78$  of the sun gear S1 of the moderation planetary gear G1, and a ring wheel R1, If it is set as gear ratio  $\lambda_3 = 30/78$  of the sun gear S2 by the side of the major-diameter sun gear of the planetary-gear set G, the sun gear S3 by the side of gear ratio  $\lambda_2 = 36/78$  of a ring wheel R2 (R3), and a minor diameter sun gear, and a ring wheel R3 I/O gear ratio The 1st \*\*: (1ST)  $(1 + \lambda_1) / \lambda_3 = 4.067$  2nd \*\*: (2ND)  $(1 + \lambda_1) (\lambda_2 + \lambda_3) / \lambda_3 = 2.354$  3rd \*\*:  $(1 + \lambda_2) / \lambda_1 = 1.564$  4th \*\*: (3RD) (4TH)  $(1 + \lambda_1) / (1 + \lambda_1 - \lambda_1, \lambda_3) = 1.161$  the 5th \*\*: (5TH)  $(1 + \lambda_1) / (1 + \lambda_1 + \lambda_1, \lambda_2) = 0.857$  the 6th \*\*: (6TH)  $1 / (1 + \lambda_2) = 0.684$  go-astern (REV): -- it is set to  $-(1 + \lambda_1) / \lambda_2 = 3.389$ . and the step between these gear ratio -- the -- the [ 1 and / between the 2nd speed / :1.73 ] -- the [ 2 and / between the 3rd speed / :1.51 ] -- the [ 3 and / between the 4th speed / :1.35 ] -- it is set to :1.25 between 4, and the :1.35 5-6th \*\* between the 5th speed.

[0083] Next, drawing 12 shows the configuration of an automatic transmission concretely in a typical cross section. Although the same reference mark is attached and being replaced with explanation about each component previously explained with reference to the skeleton, the details which cannot be referred to from a skeleton are explained here.

[0084] After the case 10 where a change gear style is held is prolonged to the method of the inside of a case from side boss section 10a and back end wall 10r before it is prolonged from 10f of the front end wall to the method of the inside of a case, it is equipped with side boss section 10b, and it is supporting the input-shaft 11 order edge through bearing by the inner circumference of both [ these ] the boss section. With this gestalt, the lubrication supply oilway L4 which carries out opening is formed in boss section inner circumference, two servo pressure-oil ways L1 and L3 which carry out opening to backside boss section 10b at a boss section periphery are formed in before side boss section 10a, and one servo pressure-oil way L2 which counters and carries out opening to the axis end of an input shaft 11 in the boss department is formed.

[0085] Make an input shaft 11 adjoin a backside supporter, it has flange 11c formed, and is having the oilway within a shaft trichotomized by shaft orientations formed in the interior. The oilway within a shaft of anterior part is used for the feeding and discarding of secondary \*\* to a torque converter among these oilways. Oilway 11 within shaft b of pars intermedia It is what the lubricating oil way L4 is open for free passage, it is used for supply of lubricous \*\*, and 11d of hind oilways within a shaft is opened for free passage by the oilway L2 within a case, and is used for the feeding and discarding of servo \*\*, i.e., line pressure. Therefore, opening of the lubricating oil way 11b is carried out to \*\*\*\* of an input shaft 11 that a lubricating oil should be emitted according to the centrifugal force by rotation of an input shaft 11 through the direction oil gallery of a path of a large number formed between before side boss section 10a and backside boss section 10b.

[0086] Next, positioning support of the planetary-gear set G is carried out with the gestalt supported by the periphery of the torque-transmission member 13 supported by the input shaft 11 through bearing in both the sun gears S2 and S3 at the anterior part of an input shaft 11 through bearing. The sun gear S3 as 1st gear change element of the planetary-gear set G is connected with the hub 64 of the 1st clutch (C-1) by the connection member 14. Moreover, the sun gear S2 as 2nd gear change element is connected with the hub 74 of the 3rd clutch (C-3). And the carrier C2 (C3) as 3rd gear change element is connected with the hub 54 of the 2nd clutch (C-2) through the torque-transmission member 13. Furthermore, the ring wheel R2 (R3) as 4th gear change element is connected with counter drive gear 19' in front of that.

[0087] The moderation planetary gear G1 fix the sun gear S1 as a reaction force element to the tip periphery of backside boss section 10b, make the ring wheel R1 as an input element connect with flange 11c of an input shaft 11, and are arranged behind the 2nd clutch (C-2). The carrier C1 as an output element is connected with the cylinder 60 common to the hydraulic servos 6 and 7 of the 1st and 3rd clutches.

[0088] Next, the hydraulic servos 6 and 7 of the 1st and 3rd clutches (C-1, C-3) The common cylinder 60 which has been arranged at the backside [ the moderation planetary gear G1 ], and was supported by the periphery of backside [ a change gear case ] boss section 10b free [ rotation ], It has the 1st piston 61 fitted in inside the cylinder 60, and the 2nd piston 71 by which the tegmentum was carried out outside. The common cylinder 60 Diameter expansion extension is carried out, the drum 62 of the 1st clutch is constituted, diameter expansion extension is carried out similarly and the 2nd piston 71 also constitutes the

drum 72 of the 3rd clutch of another side. And both [ these ] the drums 62 and 72 are mutually connected possible [ torque transmission ] by spline engagement. In short, the hydraulic servos 6 and 7 of the 1st and 3rd clutches make common the cylinder 60 which constitutes them, and while was fitted in inside the cylinder 60, and it has a piston 61 and the piston 71 of another side by which the tegmentum was carried out outside, it considers as the hydraulic servo of the confrontation which makes the actuation direction of both [ these ] pistons the reverse sense mutually, and miniaturization of the hydraulic servo by combination is attained. Hereafter, this combination configuration is called the 3rd clutch arrangement for short. In addition, each hydraulic servo is equipped with the cancellation plate and the return spring also with this gestalt.

[0089] The friction member 63 of the 1st clutch (C-1) The back up plate which consisted of the friction material and separator plates of many plates which made the hub 64 carry out spline engagement of the inner circumference side, and made the drum 62 carry out spline engagement of the periphery side, and was fixed at the tip of a drum 62, The clutch engagement actuation pinched at the piston 61 extruded by supply of the oil pressure into a hydraulic servo 6 from a cylinder 60 considers as the configuration which transmits torque to a hub 64 from a drum 62.

[0090] The friction member 73 of the 3rd clutch (C-3) The back up plate which consisted of the friction material and separator plates of many plates which made the hub 74 carry out spline engagement of the inner circumference side, and made the drum 72 carry out spline engagement of the periphery side, and was fixed at the tip of a drum 72, The clutch engagement actuation pinched at the piston 71 extruded by supply of the oil pressure into a hydraulic servo 7 from a cylinder 60 considers as the configuration which transmits torque to a hub 74 from a drum 72. And the friction members 63 and 73 of the 1st and 3rd clutches are arranged in shaft orientations, and contiguity arrangement is carried out. [ each other ]

[0091] The 2nd clutch (C-2) also includes the hydraulic servo 5. A before [ the moderation planetary gear G1 ] side, It is arranged between the planetary-gear set G and the moderation planetary gear G1. Namely, the hydraulic servo 5 The cylinder 50 which was fixed to flange 11c of an input shaft 11 in the inner circumference side, has been arranged at the periphery of an input shaft 11, carried out diameter expansion extension of the periphery side, and was used as the drum 52, It consists of a piston 51 by which endocyst was carried out to the cylinder 50, a cancellation plate of centrifugal oil pressure, and a phosphorus turn spring.

[0092] The friction member 53 of the 2nd clutch (C-2) The back up plate which consisted of the friction material and separator plates of many plates which made the hub 54 carry out spline engagement of the inner circumference side, and made the drum 52 carry out spline engagement of the periphery side, and was fixed at the tip of a drum 52, The clutch engagement actuation pinched at the piston 51 extruded by supply of the oil pressure into a hydraulic servo 5 from a cylinder 50 considers as the configuration which transmits torque to a hub 54 from a drum 52. And the friction member 53 is arranged at the inner circumference side of both the frictions members 63 and 73.

[0093] Moreover, the 1st brake (B-1) is used as a band brake, and the brake band 81 is considered as the configuration which binds tight the brake drum 82 connected with the hub 74 of the 3rd clutch (C-3). By this, the 1st brake (B-1) will not require a shaft-orientations tooth space, but will be arranged, without moreover making most direction dimensions of a path increase. In addition, the hydraulic servo of this band brake is the same shaft-orientations location as a brake band 81, and since it is what is prolonged in a tangential direction to a brake drum 82, it is omitting illustration.

[0094] The 2nd brake (B-2) is considered as a multi-plate configuration like each clutch, the hydraulic servo 9 and friction member 93 are compared with one-way clutch F-1, and are arranged at the periphery side of the planetary-gear set G, and the inner ball race of the hub 94 of a brake and an one-way clutch is connected with the carrier C2 (C3). The part lacking in the ring wheel of the planetary-gear set G of a RABINIYO format is made to carry out the lap especially of the hydraulic servo 9 of the 2nd brake (B-2) in the direction of a path, and it is arranged.

[0095] Counter drive gear 19' is supported by the periphery of before [ a case 10 ] side boss section 10a through bearing 12, and is arranged at the front end of a change gear style. It is that this configuration turns into a configuration supported without counter drive gear 19' preparing the support according to rank in a case 10, and the advantage of lightweight-izing of a case 10 is brought about.

[0096] The hydraulic servo 5 of the 2nd clutch is opened for free passage by the oilway L2 within a case formed in the back end section of a case 10 through 11d of oilways within a shaft formed in the input shaft 11. In addition, although not illustrated, the oilway L2 within a case is connected to the line pressure oilway of the valve body of hydraulic control as everyone knows. On the other hand, the hydraulic servos 6 and 7 of

the 1st and 3rd clutches are opened for free passage by the oilways L1 and L3 within [ of two ] a case formed in boss section 10b, and the sealing device of these two oilways is carried out with the seal rings 67 and 77 of every a lot inserted in the relative rotation section between hydraulic servos 6 and 7 and boss section 10b. Similarly, the oilways L1 and L3 within [ of two ] a case are also connected to the line pressure oilway of the valve body of hydraulic control.

[0097] As mentioned above, the sealing device of the 11d of the one oilway opened for free passage by the hydraulic servo 5 of the 2nd clutch is carried out by one seal ring 11e inserted between the inner circumference of backside [ the back end section of a case 10 ] boss section 10b, and the back end section periphery of an input shaft 11. About the 2nd clutch (C-2), thus, the hydraulic servo 5 Since the configuration opened for free passage by the oilway L2 formed in backside [ a case 10 ] boss section 10b through 11d of oilways within a shaft which fixed to the periphery of an input shaft 11 and were formed in the input shaft 11 is taken, The supporter to the case 10 of an input shaft 11 can perform the sealing device of an oilway now by seal ring 11e of a single and a minor diameter. Usually, the number of seal rings is reduced to the seal ring of a lot being needed for carrying out the sealing device of the part where one oilway passes along the relative rotation section. Therefore, a sliding friction is reduced and the efficiency of transmission of a change gear improves because the diameter of a seal ring is [ reduction of the number of seal rings by this configuration, and ] a minor diameter.

[0098] moreover, about the 1st and 3rd clutches (C-1, C-3) which are other two clutches By arranging those hydraulic servos 6 and 7 using boss section 10b extended from the case 10 established for support of the moderation planetary gear G1 Since the supply oilways L1 and L3 can make one place the part which passes along the relative rotation section at a time, The seal rings 67 and 77 of every a lot for which it is usually needed at worst can perform the sealing device of an oilway, and the number of seal rings for the sealing device of the oilways L1-L3 of the whole which includes the hydraulic servos 5, 6, and 7 of the 1st - the 3rd clutch by that cause is held down to minimum.

[0099] Furthermore, the input shaft 11 is opened for free passage by the oilway L4 which lubricating oil way 11b was formed ahead [ of 11d of oilways within a shaft ], and was formed in before [ the front end section of a case 10 ] side boss section 10a by \*\*\*\* of an input shaft 11. It makes it possible to perform it, without moreover overlapping 11d of oilways within a shaft to a hydraulic servo 5, and lubricating oil way 11b within an input shaft 11 using the input shaft 11 same as supply of the lubricating oil to the planetary-gear set G, although this configuration uses the input shaft 11 for the hydraulic pressure supply to the hydraulic servo 5 of the 2nd clutch, and minor diameter-ization of an input shaft is made. Minor diameter-ization of such an input shaft 11 is useful to the sun gear S2 of the planetary-gear set G by which outer fitting support is carried out at it, and minor diameter-ization of S3 path, as a result is useful to lightweight-ization of the change gear by miniaturization of the whole planetary-gear set G which is the maximum weight member.

[0100] Next, drawing 13 shows the 5th operation gestalt which was reversed after the real kickback and has arranged each element to the 4th operation gestalt which used the 3rd clutch arrangement in the cross section [-izing / the cross section / the \*\* type ]. In this case, both the hydraulic servos 6 and 7 of the moderation planetary gear G1 and the 1st and 3rd clutches (C-1, C-3) arranged in the 4th operation gestalt at backside [ a case 10 ] boss section 10b are transferred to before side boss section 10a, that sequence and the sense are reversed, and, instead, counter drive gear 19' is supported by backside boss section 10b. Since an input shaft 11 will carry out termination in the arrangement part of the 2nd clutch (C-2) with the inversion of this arrangement, the intermediate shaft 12 is formed in \*\* like said 1st operation gestalt. And it is supposed that the supply oilway to each hydraulic servo is the same as that of the 1st operation gestalt. Namely, the hydraulic pressure supply to the hydraulic servos 6 and 7 of the 1st and 3rd clutches It is carried out from the oilways L1 and L3 within a case of boss section 10a. The hydraulic pressure supply to the hydraulic servo 6 of the 2nd clutch Similarly it is carried out through oilway 11 within shaft a of an input shaft 11 from the oilway L2 within a case of boss section 10a, and supply of the lubrication oil pressure to oilway 12b for lubrication within an intermediate shaft is performed through the axis end of an intermediate shaft 12 from the oilway L4 within a case in boss section 10b. In this case, as Signs 57, 67, 77, and 12e show to drawing, the number of seal rings needed becomes 3 sets and one piece, and is the same as that of the case of the 1st operation gestalt. In addition, although it is not directly related to the hydraulic pressure supply made into the theme of this invention, unlike the 4th operation gestalt, the output of counter drive gear 19' will be transmitted to differential equipment through a counter driven gear and a differential-gear drive pinion gear with a moderation function on the relation which has arranged counter drive gear 19' at the posterior part of a change gear style.

[0101] By the way, also in the configuration of this horizontal type, the 2nd clutch (C-2) can be separated from moderation planetary gear to the 3rd clutch arrangement, and it can also take it with the configuration arranged to a side after the planetary-gear set G. [ as well as the relation of said 1st operation gestalt and 2nd operation gestalt ] Drawing 14 shows the 6th operation gestalt which takes such a configuration in the cross section [-izing / the cross section / the \*\* type ]. In this case, to the previous 5th operation gestalt, the planetary-gear set G is ahead transferred only for the part of the 2nd clutch (C-2), and to the backside [ that part ] tooth space, the 2nd clutch (C-2) turns cylinder opening of that hydraulic servo 50 at the planetary-gear set G side, and is arranged. And an input shaft 11 is again used as 1 shaft.

[0102] Even if it takes such arrangement, the oilways L1 and L3 for the hydraulic servos 6 and 7 of the 1st and 3rd clutches by preparing in before side boss section 10a. Since these oilways are added and the number of oilways of boss section 10a becomes the lubricating oil way L4 and 3 in all, although major-diameter-ization of the diameter of a seal ring accompanying diameter expansion of the some of a boss section 10a outer diameter is not avoided, the number of seal rings for the sealing device of these oilways can be made the same. Moreover, about the oilway L2 for the hydraulic servo 5 of the 2nd clutch, and 11a, only one piece is sufficient for shaft-peripheral-seal 11e.

[0103] Next, drawing 15 shows the 7th operation gestalt. This gestalt is altogether taken with the configuration of the reverse sense to the above-mentioned 6th operation gestalt. In this case, the supply oilway L4 of lubrication oil pressure and the relation of 11b were replaced with the supply oilway L2 to the hydraulic servo 5 of the 2nd clutch, and 11a to the 6th operation gestalt.

[0104] Next, drawing 16 shows the 8th operation gestalt. This gestalt replaces arrangement of counter drive gear 19' with the 2nd clutch (C-2) to the above-mentioned 7th operation gestalt. In this operation gestalt, a greatly different point from other gestalten is in the point arranged on the periphery of before side boss section 10a, after carrying out connection support of the hydraulic servo 5 of the 2nd clutch at rotation impossible at the flange of an input shaft 11. That is, the configuration to which hydraulic pressure supply to the cylinder 50 of a hydraulic servo 5 is directly carried out through an input shaft 11 from the oilway L2 within a case is taken by arranging the inner circumference of the drum 52 which constitutes the cylinder 50 of a hydraulic servo 5 on the periphery of boss section 10a.

[0105] Moreover, in this arrangement, since counter drive gear 19' is located in the pars intermedia of a change gear style, support 10s is prepared between 10f of front end walls of the change gear case 10, and back end wall 10r, and it is supported by that inner circumference through bearing 12. And since a change gear style is divided forward and backward on both sides of support 10s, spline engagement connection of the hub 54 as an output side member of the 2nd clutch is carried out by the support 10s inner circumference side at the carrier C3 of the planetary-gear set G. Moreover, connection to counter drive gear 19' and the ring wheel R3 as an output element of the planetary-gear set G is also considered as the spline engagement connection by the side of support 10s inner circumference.

[0106] Next, drawing 17 shows the 9th operation gestalt. This gestalt replaces the location of counter drive gear 19' with the 2nd clutch (C-2) to said 5th operation gestalt shown in drawing 13. In this case, counter drive gear 19' is considered as the central arrangement supported at support 10s prepared in the center of a change gear style. Thus, since it is effective after that using a support 10s periphery side for the hydraulic servo of the 2nd brake (B-2) miniaturizes when center support 10s is prepared, about the 2nd brake (B-2), also including the physical relationship over an one-way clutch (F-1), the sense of a hydraulic servo 9 and the friction member 93 was reversed, and it arranges. And the increment in the axial length for center support arrangement is offset by making the tooth space of the periphery of the planetary-gear set G produced by this modification carry out the polymerization of the friction member 53 of the 2nd clutch (C-2).

[0107] In this arrangement, it is the semantics of compaction of \*\* and axial length become the arrangement in which the hydraulic servo 5 of the 2nd clutch (C-2) is located in the backmost part of a change gear style, and seal ring 11e is arranged at inside-and-outside periphery physical relationship to the bearing 15 which supports the back end section of an input shaft 11 to backside [ a case 10 ] boss section 10b. The arrangement to the backmost part of the hydraulic servo 5 of this 2nd clutch (C-2) Since oilway 11a to the hydraulic servo 5 of the 2nd clutch within an input shaft 11 (C-2) can be made into the die length which does not influence formation of parenchyma top lubricating oil way 11b, the lubricating oil way length within an input shaft 11 is fully secured, and let the point that the lubrication of each part of a change gear style can be performed uniformly be an advantage.

[0108] Next, drawing 18 shows the 10th operation gestalt. This gestalt is transposed to the 1st clutch arrangement which used only the connection relation of the 1st and 3rd clutches (C-1, C-3) with the 1st

operation gestalt to the 4th operation gestalt using the 3rd clutch arrangement shown in drawing 12 . However, with this gestalt, the friction members 63 and 73 of the 1st and 3rd clutches (C-1, C-3) are brought near by the periphery side of a hydraulic servo 6 for much more compaction of change gear axial length. Much more compaction of the axial length of a change gear is achieved by major-diameter-izing the friction member 53 of the 2nd clutch (C-2), and reducing configuration number of sheets, and arranging to the periphery side of the own hydraulic servo 5. Supply of each oil pressure in this case is the same as that of the case of the 4th operation gestalt.

[0109] Next, drawing 19 shows the 11th operation gestalt. This gestalt moves the location of counter drive gear 19' to a change gear style center section to the above-mentioned 10th operation gestalt. Since the planetary-gear set G serves as arrangement located in the foremost part of a change gear style in this formation, the before side boss section loses and supply of the oil pressure to oilway 11b for lubrication is made to be made directly from the oilway L4 within [ of 10f of front end walls ] a case. Moreover, the sense of the 2nd brake (B-2) and an one-way clutch (F-1) is made into the reverse sense, and the hydraulic servo 9 of a brake is considered as the configuration built in 10f of front end walls.

[0110] Next, drawing 20 shows the 12th operation gestalt. This gestalt moves the 2nd clutch (C-2) to a before side to the above-mentioned 11th operation gestalt. In this arrangement, it considers as the same arrangement as the 8th operation gestalt shown in drawing 16 about the hydraulic servo 5 of the 2nd clutch.

[0111] Next, drawing 21 shows the 13th operation gestalt. With this gestalt, the arrangement altogether reversed to the above-mentioned 12th operation gestalt is taken. In addition, with this gestalt, the hydraulic servo 9 of the 2nd brake (B-2) is considered as the configuration made to build in back end wall 10r of the change gear case 10. In the case of this gestalt Since it becomes the configuration that the supply oilways L1 and L3 to the hydraulic servo of the 1st and 3rd clutches (C-1, C-3) and two supply oilways L4 of the for the supply oilway L2 to the hydraulic servo of the 2nd clutch (C-2) and for lubrication in backside body 10b are arranged at a time, respectively, in before side body 10a The effectiveness that an oilway can be distributed with sufficient balance is acquired.

[0112] Next, drawing 22 shows the 14th operation gestalt. This gestalt moves the location of counter drive gear 19' back to the above-mentioned 13th operation gestalt:

[0113] Next, drawing 23 shows the 15th operation gestalt. With this gestalt, it has put on the backmost part of a change gear style by making counter drive gear 19' into back further to the above-mentioned 14th operation gestalt.

[0114] Finally, drawing 24 shows the 16th operation gestalt. This gestalt moves the location of the 2nd clutch (C-2) support 10s ahead to the 13th operation gestalt shown in drawing 21 . In addition, since the planetary-gear set G will be located in the backmost part of a change gear style in the case of this gestalt, boss section 10b of case back end wall 10r become unnecessary originally, but it be the semantics of axial length compaction, and very short boss section 10b be prepared in order to make the lap of the shaft-peripheral-seal 12e of an intermediate shaft 12 carry out in the direction of a path to the bearing which support the back end side of an intermediate shaft 12.

[0115] As mentioned above, this invention is illustrated about what made the PURANERI gear set the RABINIYO type, and although the operation gestalt which changed connection relation into the arrangement list of a component was mentioned and explained in full detail, a comparatively good gear ratio step is obtained by the device connection-related [ those ] also considering a PURANERI gear set as the combination of simple planetary gear and double planetary gear, or a combination of double planetary gear. Even if it applies this invention to such a gear train, it demonstrates the same effectiveness. therefore, this invention is not limited to these operation gestalt, can be variously looked like [ each claim of a claim ] within the limits of the matter of a publication, and can change and carry out a concrete configuration.

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[Translation done.]

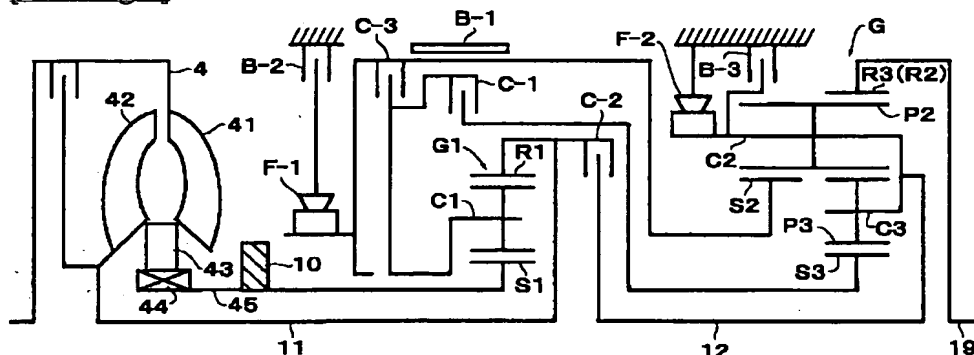
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## DRAWINGS

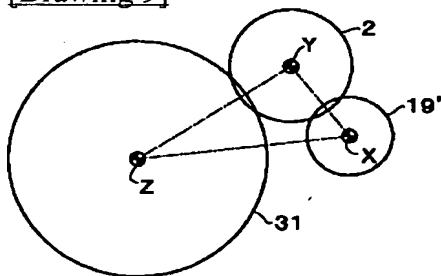
[Drawing 1]



[Drawing 2]

	C-1	C-2	C-3	B-1	B-2	B-3	F-1	F-2	ギヤ比	ステップ
P										
R			O			O			3.394	
N										
1st	O					Δ		O	4.148	1.75
2nd	O			Δ	O		O		2.370	1.52
3rd	O		O		●				1.558	1.35
4th	O	O			●				1.165	1.34
5th		O	O		●				0.858	1.25
8th		O		O	●				0.688	

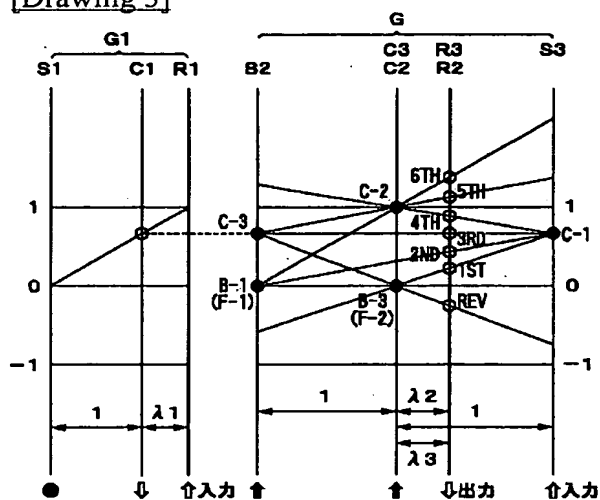
[Drawing 9]



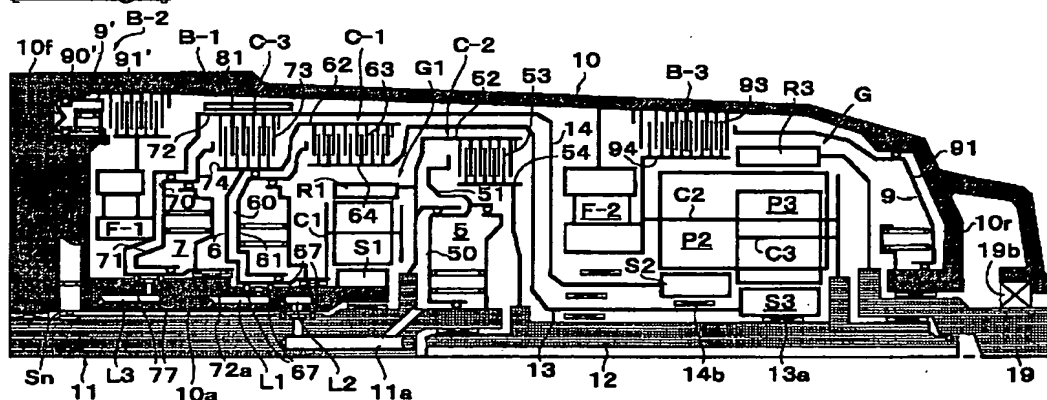
[Drawing 10]

	C-1	C-2	C-3	B-1	B-2	F-1	ギヤ比	ステップ
P								
REV			○		○		3.389	
N								
1ST	○				(○)	○	4.067	1.79
2ND	○			○			2.354	1.51
3RD	○		○				1.564	1.35
4TH	○	○					1.161	1.35
5TH		○	○				0.857	1.25
6TH		○		○			0.684	

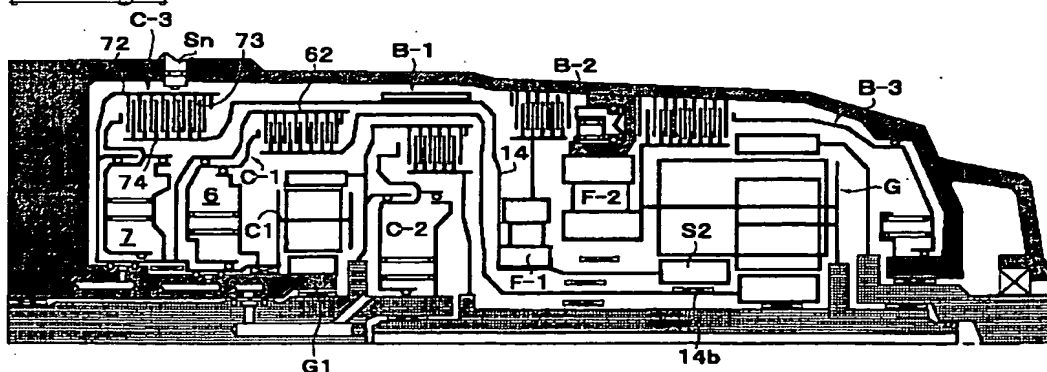
[Drawing 3]



[Drawing 4]

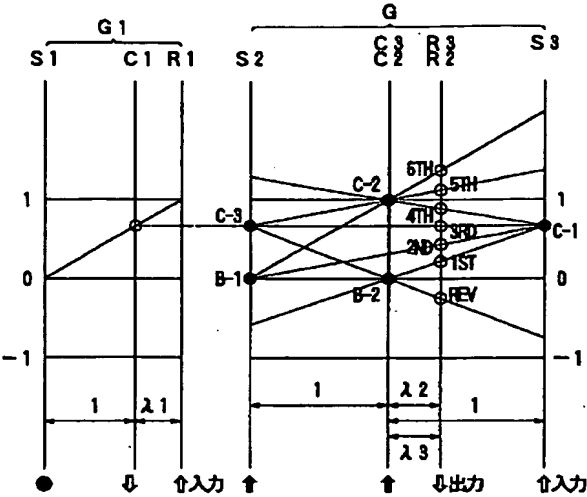


[Drawing 5]

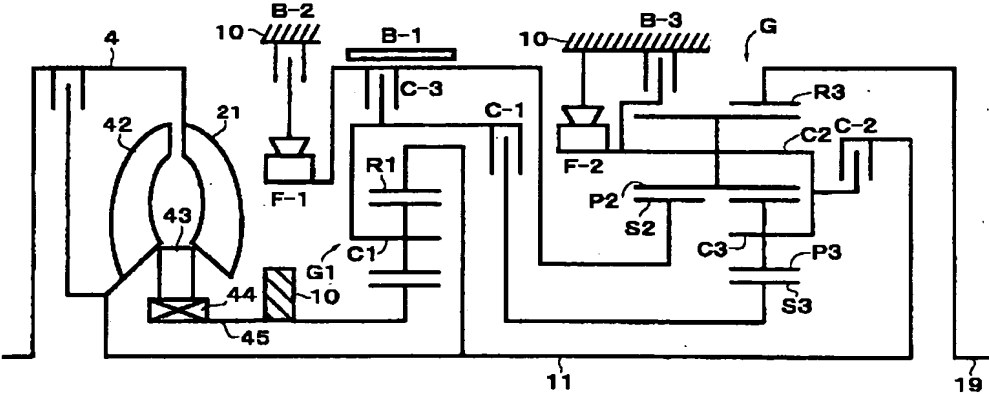


[Drawing 11]

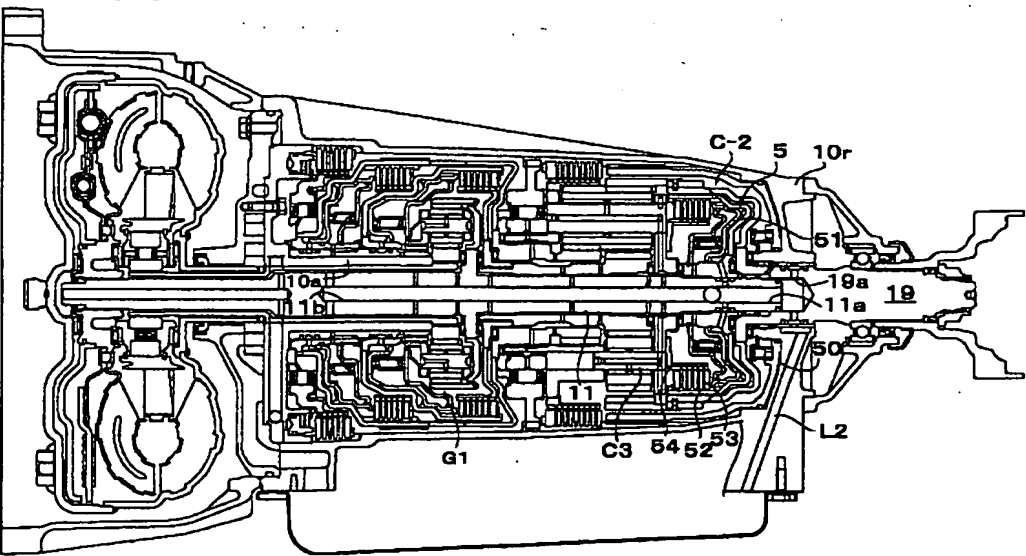




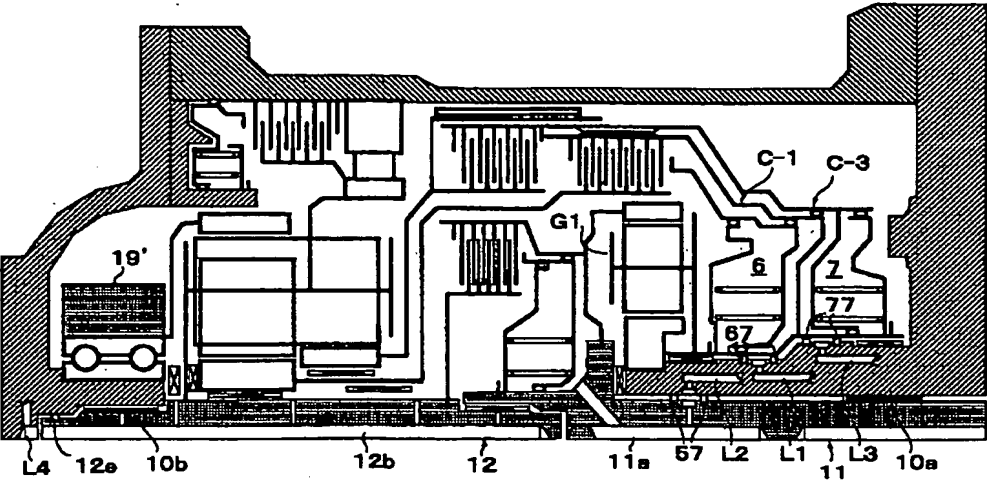
[Drawing 6]



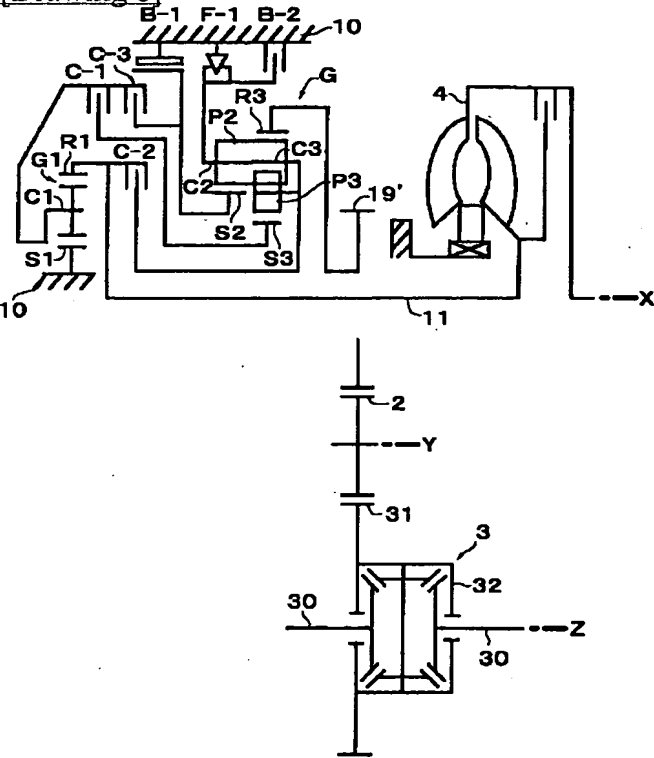
[Drawing 7]



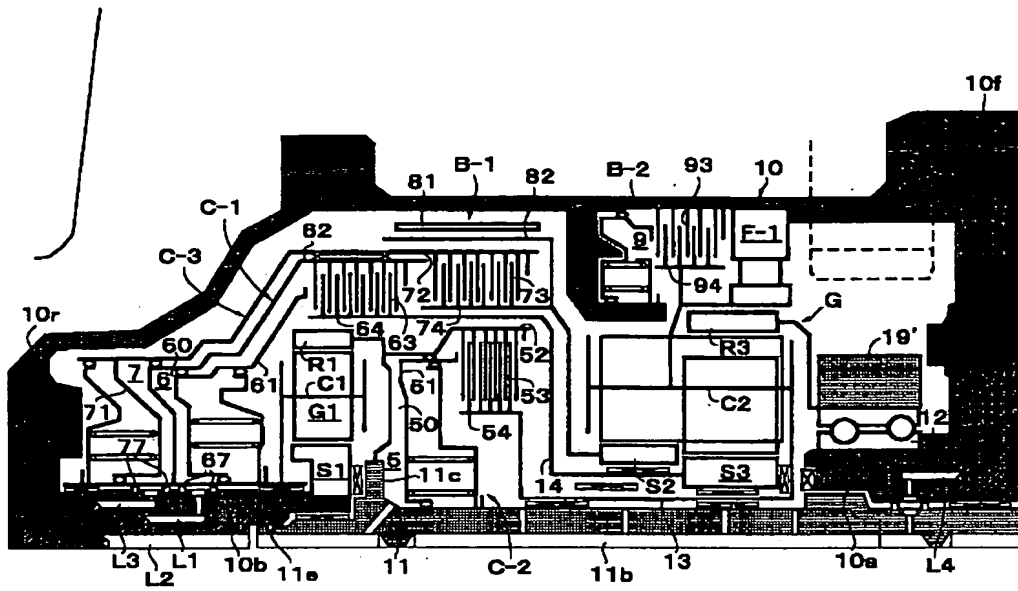
[Drawing 13]



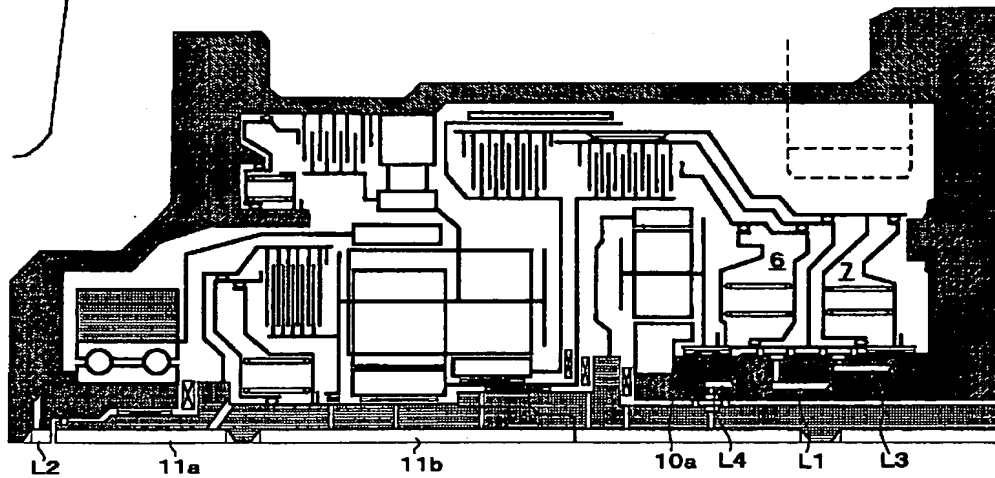
[Drawing 8]



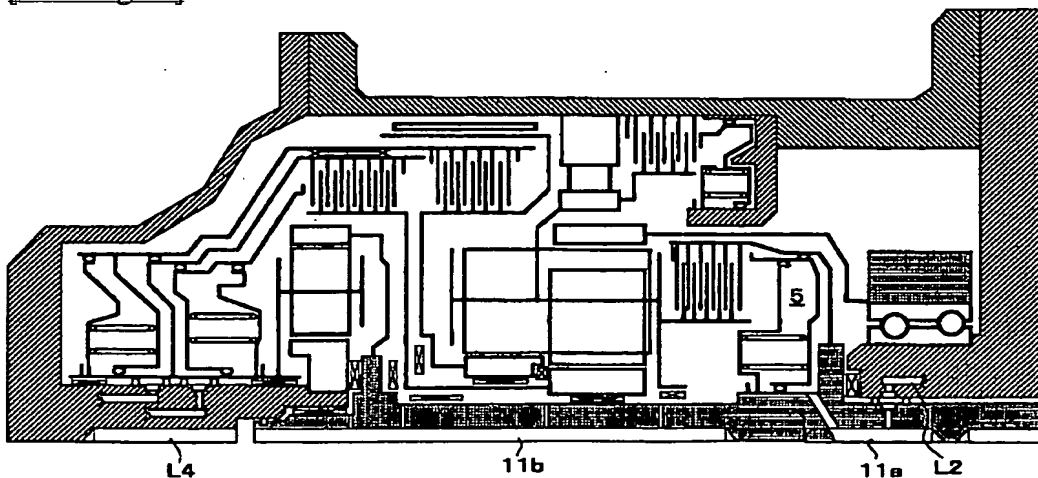
[Drawing 12]



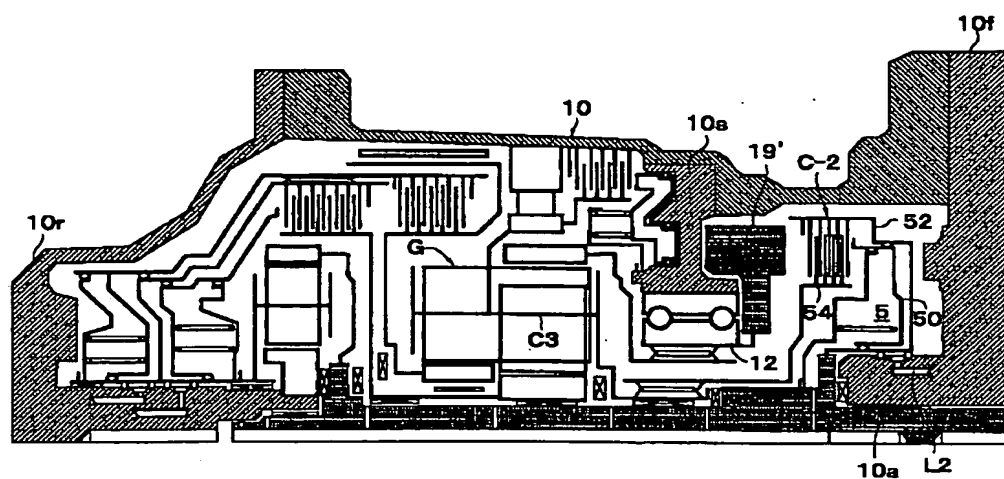
[Drawing 14]



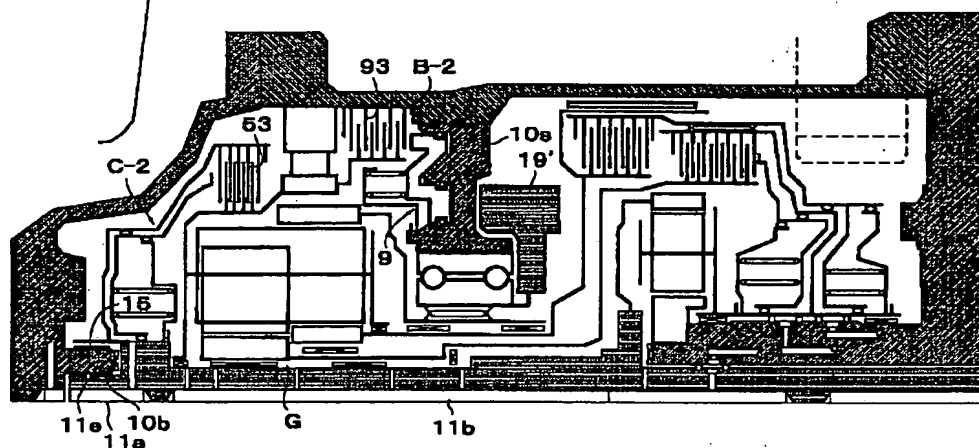
[Drawing 15]



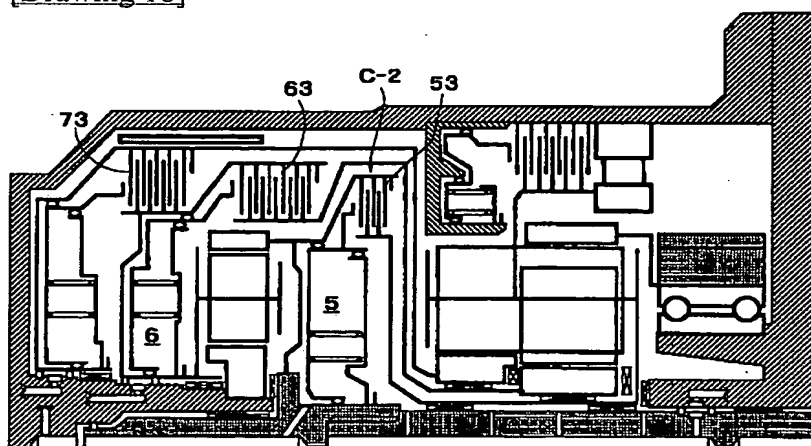
[Drawing 16]



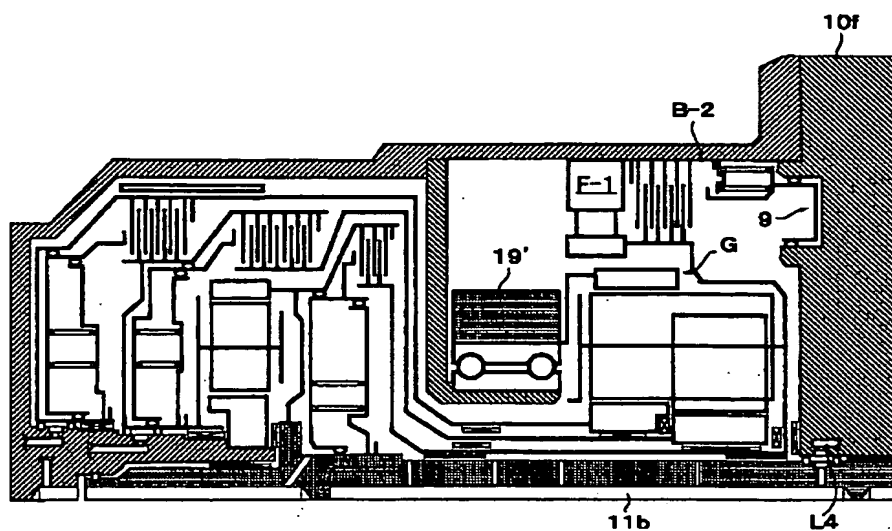
[Drawing 17]



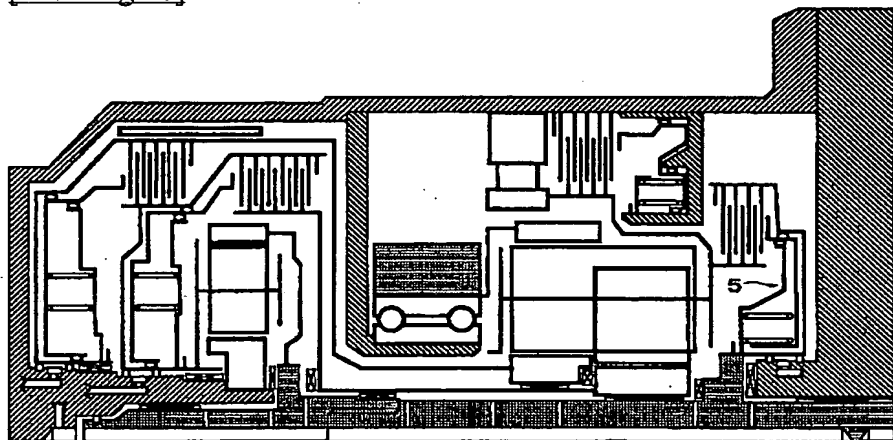
[Drawing 18]



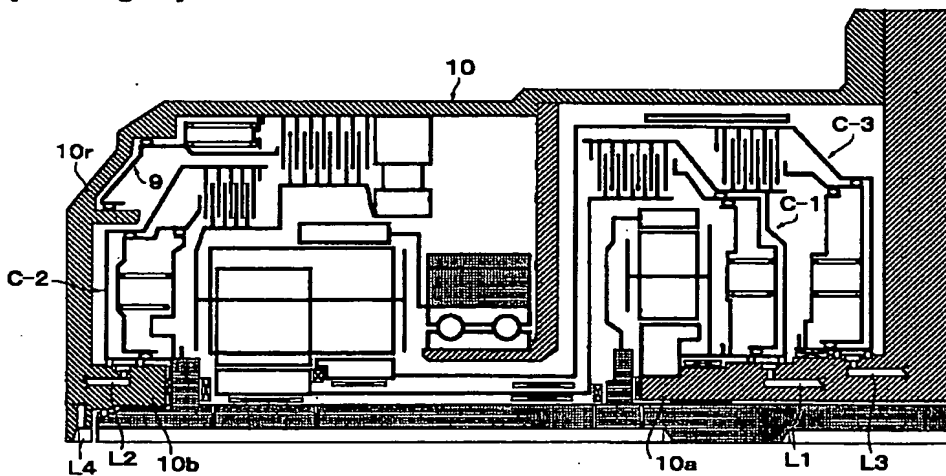
[Drawing 19]



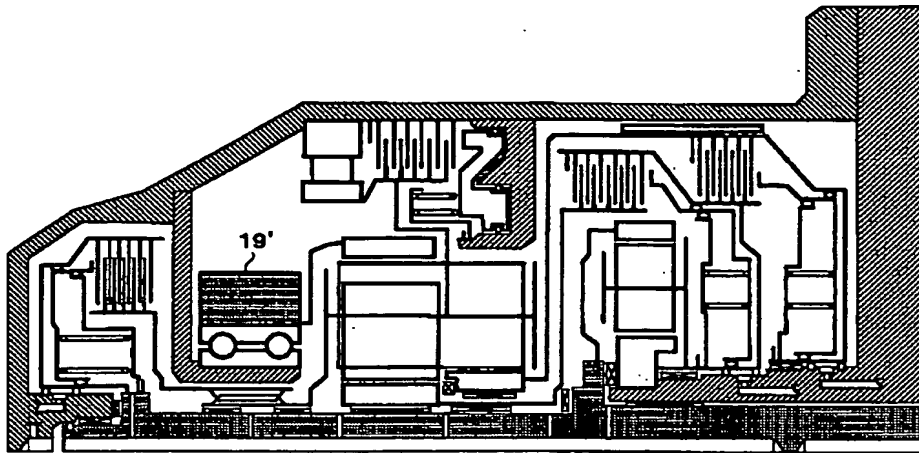
[Drawing 20]



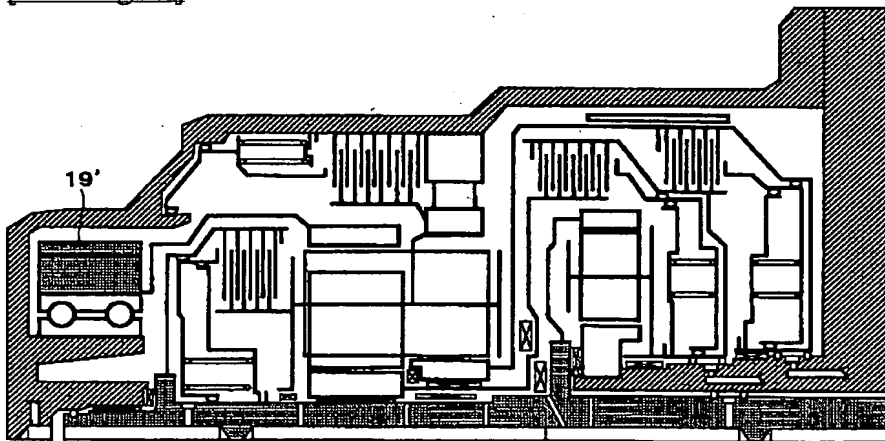
[Drawing 21]



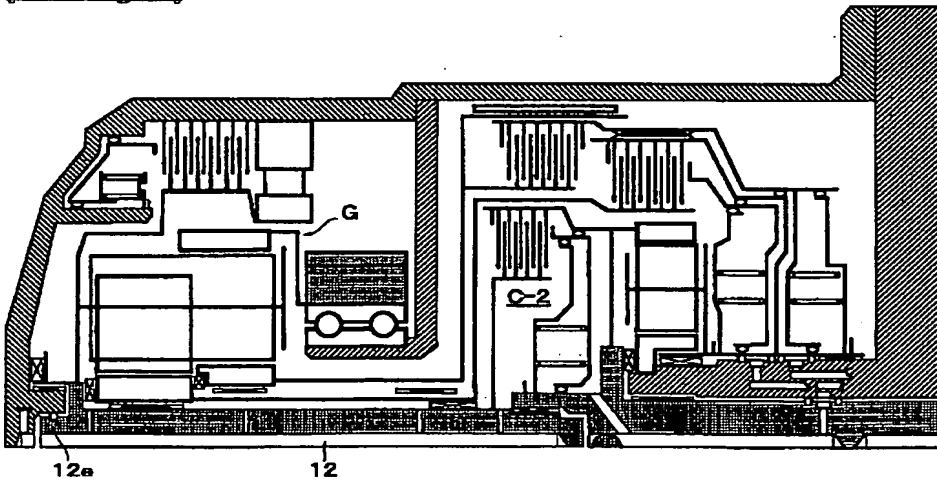
[Drawing 22]



[Drawing 23]



[Drawing 24]



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[Translation done.]

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